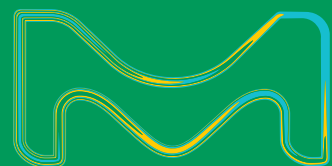


Phytochemical Standards

Analytical standards and certified
reference materials for constituents
of medicinal plants



The life science business
of Merck KGaA, Darmstadt,
Germany operates as
MilliporeSigma in the
U.S. and Canada.

Analytical Products

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Phytochemical Standards

Analytical standards and certified reference materials for constituents of phytochemicals

Long before the advent of modern medicine and synthetically produced pharmaceuticals, herbal medicines have been used for the treatment and prevention of diseases and afflictions. Based on the empirical knowledge of generations, rich traditions of natural medicine have evolved independently in different regions of the globe.

Nowadays, herbal medicinal products continue to play an important role in global health care. Traditional Indian medicine (Ayurveda) and traditional Chinese medicine (TCM) are increasingly popular in the Western world. Also, plants play a substantial role in dietary supplements.

Due to the complexity of plant derived materials, and the fact that herbal medicinal products have supposedly been safely used for ages, until a few years ago, no significant quality control had been demanded for these products by the authorities (quite the opposite of synthetically produced pharmaceuticals). However, in the last two decades, the perception has changed, and it is agreed that herbal medicinal products do, in fact, need effective quality control in order to ensure that the products are safe and meet established quality standards. The composition of a plant may vary dramatically depending on season or location of harvest. Therefore, active or potentially harmful toxic components may vary in concentration and need to be controlled.

We offer a substantial portfolio of analytical standards and reference materials for key ingredients of the most widely used medicinal herbs. The portfolio is comprised of more than 600 products and continues to grow. If you don't find the product that you require in this brochure, please browse the up-to-date portfolio on **[SigmaAldrich.com/phytochemicals](https://www.sigmaaldrich.com/phytochemicals)** or contact us.

While all analytical standards are tested thoroughly for identity and chromatographic purity, we also offer an expanding portfolio of primary pharmaceutical standards for herbal medicinal product analysis, as well as an increasing number of *TraceCERT*[®] Certified Reference Materials (CRM).

This brochure is focusing on the natural plant constituents. However, as shown on page 59, we also offer other standards and reference materials that are required for the testing of herbal medicines such as pesticides, mycotoxins, inorganic standards and microbiological CRMs.

Primary Pharmaceutical Standards

Our selection of analytical standards for active substances and marker compounds of herbal medicinal products includes a growing range of primary pharmaceutical standards. These standards are manufactured and qualified by HWI-Analytik in Rülzheim (Germany) and exclusively distributed by MilliporeSigma.

The absolute content determination of these products is performed by quantitative NMR (qNMR). qNMR is increasingly applied, not only for the content assignment of natural products, but also by the pharmaceutical industry in general as an orthogonal method and alternative to the very common, but laborious "mass balance" approach. The MilliporeSigma in-house produced organic *TraceCERT*[®] certified reference materials also use qNMR for quantification (see page 8).

In addition to the quantitative value determined by qNMR, the certificates of the primary pharmaceutical standards from HWI also list a value for the chromatographic purity. These two values may differ since not all impurities are detected by chromatography. For quantitative calculations, the qNMR value should be used.

More detailed information about these products can be found in articles published in our *Analytix* magazine (issue 1/2010 pages 11 – 15) which can be downloaded at **SigmaAldrich.com/analytix**

The portfolio of primary pharmaceutical standards currently consists of over 100 products listed on the following pages. This selection is continuously growing, and an up-to-date listing can be found at: **SigmaAldrich.com/phytopharma**

Description	Package	Cat. No.
trans-Anethol	100 mg	00130595
p-Anisaldehyde	50 mg	05320590
Apigenin	10 mg	01760595
Apigenin-6,8-diglucoside (Vicenin 2)	10 mg	03980585
Apigenin 7-glucoside	10 mg	00720585
Apigenin 7-O-glucuronide	10 mg	04490590
Arbutin	50 mg	00890590
β-Asarone	25 mg	02890590
Asiaticoside	10 mg	04560590
Aspalathin	10 mg	03520585
Aucubin	25 mg	00090590
Bilobalide	10 mg	00760595
(-)-α-Bisabolol	100 mg	00320188
Bisabolol oxide A	25 mg	00630590
(-)-Bornyl acetate	50 mg	00400585
Camphene	100 mg	01410590
Camphor (dl)	100 mg	02070595
(+)-3-δ-Carene	100 mg	00410590
Carnosic acid	10 mg	05330590
Carvacrol	50 mg	04270590
(-)-Carvone	100 mg	00290595
Casticin	10 mg	01940590
(+)-Catechin	10 mg	03910590
Chlorogenic acid	25 mg	00500590
1,8-Cineole (Eucalyptol)	100 mg	00020590
p-Coumaric acid	50 mg	03200595
Coumarin	50 mg	01260595
Curcumin	10 mg	00280590
Daidzein	50 mg	05340590
Daidzin	10 mg	05370590
Echinacoside	10 mg	01710580
Ellagic acid	50 mg	05350590
Epicatechin	10 mg	03940590
(-)-Epicatechin 3-gallate	10 mg	03950590
Epigallocatechin	10 mg	03960590
Epigallocatechin gallate	10 mg	03970590
Eriocitrin	10 mg	02660590
Eucalyptol (1,8-Cineole)	100 mg	00020590
Eugenol	100 mg	01050595
(+)-Fenchone	100 mg	00380590
Genistein	50 mg	05360590
Genistin	25 mg	05380590

Description	Package	Cat. No.
Geranyl acetate	100 mg	01290190
Ginkgolic acid C15:1	10 mg	02580185
Ginkgolic acid C17:1	10 mg	01390590
Ginkgolide A	25 mg	00770590
Ginkgolide C	25 mg	01490590
Ginsenoside Rb1	10 mg	00170580
Ginsenoside Re	10 mg	03000590
Ginsenoside Rg1	10 mg	00370580
Glycyrrhizic acid ammonium salt	50 mg	01250570
Harpagoside	25 mg	00420580
Hederacoside C	10 mg	00930585
α-Hederin	10 mg	01240585
Herniarin	10 mg	02250595
Hesperidin	25 mg	04650590
Hulupinic acid	10 mg	01090595
Hypericin	10 mg	00190585
Hyperoside	25 mg	00180585
(1S,2R,5R)-(+)-Isomenthol	25 mg	04280590
Isoorientin	10 mg	03820585
(-)-Isopulegol	50 mg	04570595
IsoquercitrinA	25 mg	00140585
Isorhamnetin	10 mg	04290585
Isorhamnetin-3-O-β-D glucopyranosyl-(1→2)-β-D glucopyranosyl-(1→6)-β-D glucopyranoside	10 mg	00960590
Isovitexin	10 mg	01120590
Kaempferol	10 mg	00550580
Kaempferol-3-glucoside	10 mg	04500585
Larixylacetat	50 mg	02730595
(R)-(+)-Limonene	100 mg	00590590
Linalool	100 mg	00350190
Luteolin	25 mg	03880590
Luteolin 7-glucoside	10 mg	03600585
Luteolin-7-O-β-D-glucuronide	10 mg	04480585
Menthofuran	50 mg	04580595
(+)-Menthofuran	50 mg	04580595
(-)-Menthol	100 mg	00580590
(-)-Menthone	100 mg	04660585
Menthyl acetate	100 mg	04590595
Myrcene	50 mg	04600585
Myricetin	10 mg	05390590
Myricitrin	10 mg	02180585
trans-Nerolidol	50 mg	04610590

Phytochemical Standards

Description	Package	Cat. No.
Oleanolic acid	10 mg	03920590
Oleuropein	10 mg	05400590
Orientin	10 mg	03810585
Osthole	10 mg	02150595
(-)- β -Pinene	100 mg	00080590
α -Pinene	100 mg	00040590
Protocatechuic acid	50 mg	03930590
(+)-Pulegone	100 mg	04620590
Quercetin dihydrate	50 mg	00200595
Quercetin 3-glucuronide	25 mg	00310590
Quercitrin	25 mg	00740580
Rosmarinic acid	25 mg	00390580
Rutin trihydrate	50 mg	00300590
Sabinen hydrate	50 mg	04630590
Salidroside	10 mg	05410590
Sennoside A	25 mg	01870575

Description	Package	Cat. No.
Sennoside B	25 mg	00530580
β -Sitosterol	10 mg	05410590
Silybin	25 mg	02000585
Stevioside	25 mg	05420590
Taxifolin	10 mg	03890585
Terpinen 4-ol	50 mg	03900590
γ -Terpinene	100 mg	04640590
α -Terpineol	100 mg	03420590
Thymol	100 mg	00670590
Ursolic acid	10 mg	03240595
Valerenic acid	10 mg	02010595
Verbascoside	10 mg	00820580
Vitexin	10 mg	00840595
Vitexin 2-O-rhamnoside	10 mg	00660585
Xanthohumol	10 mg	01130595



Plant Extracts

For calibration, substance verification and plant authenticity testing we offer a series of extract reference materials of some of the most widely used medicinal plants. The extracts are qualified as secondary standards, providing quantitative values for one or several marker ingredients as well as identity confirmation and peak assignment for additional key constituents of the plant. The values are traceable to HWI primary pharmaceutical standards. The product is delivered with a leaflet containing chromatographic method and example chromatograms with peak assignment (**SigmaAldrich.com/plantextracts**).

Description	Quantitative Marker Ingredients	Qualitative Marker Ingredients	Product Number
Camellia sinensis extract	Epigallocatechin gallate	Catechin, Epicatechin, Epicatechin gallate, Epigallocatechin, Epigallocatechin gallate	05495001
Crataegus spp extract	Vitexin rhamnoside	Vitexin-2-O-rhamnoside, Chlorogenic acid, Hyperoside	05095001
<i>Ginkgo Biloba</i> extract	Bilobalide, Ginkgolide A	Bilobalide, Ginkgolide A, Ginkgolide B, Ginkgolide C	05485001
Harpagophytum procumbens extract	Harpagoside	8-p-Coumaryl harpagide, Harpagoside	05125001
Hypericum perforatum extract	Hypericin	Hypericin, Pseudohypericin	05295001
Panax ginseng extract	Ginsenosides Rb1+Rg1	Ginsenosides Rg1, Rb1, Re, Rf, Rg2, Rc, Rb2, Rd	05115001
Passiflora incarnata extract	Isovitexin	Vitexin, Orientin, Homoorientin, Isovitexin	05085001
Senna extract	Sennoside B	Sennoside A, Sennoside B	05475001
Silybum marianum extract	Silybin A+B	Silicristin, Silidianin, Isosilbinin A, Isosilbinin B, Silybin A, Silybin B	05135001
Valeriana officinalis extract	Valerenic acid	Valerenic acid, Hydroxyvalerenic acid, Acetoxyvalerenic acid	05105001



TraceCERT® Certified Reference Materials

For ISO/IEC 17025 accredited labs, it is important to show traceability of all results to an internationally recognized standard, so for calibration, certified reference materials (CRMs) must be used. Our rapidly expanding TraceCERT® product range includes an increasing number of certified reference materials for natural products.

TraceCERT® products are manufactured under ISO/IEC 17025 and ISO Guide 34 double accreditation, which is the highest achievable quality level for reference material producers and which is also referred to as “the gold standard”. All TraceCERT® products are delivered with a comprehensive certificate according to ISO Guide 35 including properly calculated uncertainties taking into account homogeneity and stability of the material.

These neat CRMs are certified by quantitative NMR (qNMR) and traceable to NIST SRM.

The complete range of organic TraceCERT® products can be found at:
[SigmaAldrich.com/organiccrm](https://www.sigmaaldrich.com/organiccrm)

So far, the following natural products CRMs are available:

Description	Package	Cat. No.
<i>p</i> -Anisaldehyde	100 mg	43621
L-Ascorbic acid	100 mg	57803
Benzyl alcohol	100 mg	39971
Benzyl benzoate	1mL	55177
Betaine	50 mg	30056
Biotin	50 mg	91827
<i>trans</i> -Caffeic acid	50 mg	51868
Caffeine	100 mg	56396
Capsaicin	50 mg	75049
(+)-Carvone	100 mg	79245
Citric acid	100 mg	94676
Coumarin	100 mg	72609
<i>p</i> -Cymene	100 mg	49679
Digoxin	50 mg	04599
Eucalyptol	100 mg	95656
Eugenol	100 mg	79891
<i>trans</i> -Ferulic acid	50 mg	52229
Fumaric acid	100 mg	76635
Gallic acid	100 mg	91215
Glutaric acid	100 mg	89147
Glycolic acid	100 mg	94815

Description	Package	Cat. No.
Linalool	50 mg	61706
Magnesium L-lactate hydrate	100 mg	40394
L(-)-Malic acid	100 mg	09172
Malonic acid	100 mg	68714
Quinine	50 mg	69311
Reserpine	50 mg	06859
Resorcinol	100 mg	53363
<i>trans</i> -Resveratrol	100 mg	76511
Safrole	100 mg	08010
Salicylic acid	50 mg	52341
Sodium propionate	100 mg	49894
Succinic acid	100 mg	49893
L(+)-Tartaric acid	100 mg	41447
Vanillic acid	50 mg	68654
Vanillin	50 mg	30304

HPLC Methods for Separation of Medicinal Plants

To demonstrate the excellent separation capability and versatility of our Ascentis® Express columns and sample preparation products, examples of analytical applications for the separation of key ingredients of widely used herbal medicinal products are shown on the following pages.

Since the characteristic components of a plant are often structurally very similar, their separation can be challenging and requires both good skills and the best suited separation columns. The applications have usually been developed and optimized using a mixture of the available analytical standards, and are then applied to either plant extracts or commercially available herbal medicinal products. The four examples outlined in this document include various chemical compound classes such as Flavonoids (Silybum), Steroidal lactones (Withania) and Triterpenoids (Boswellia and Ginseng).



1. Separation of Silymarin Components

Introduction

Silymarin, derived from the milk thistle plant (*Silybum sp.*), has been used as a natural remedy for the treatment of a number of liver diseases as well as in the protection of the liver from potential toxins. More recently, silymarin has been connected to anti-tumor promoting activity¹. It is therefore of interest to have analytical methods available for the analysis of silymarin components in various matrices.

The silymarin complex consists of several closely related, biologically active components. The objective of this study was to investigate several modern, stationary-phase chemistries for optimal selectivity towards the

development of an efficient method for the analysis of silymarin. The method would optimally provide baseline resolution for nine of the known components of silymarin in less than 15 minutes.

Initial screening experiments were used to select a single combination of stationary phase and organic modifier that demonstrates the greatest potential for the separation. The information from subsequent optimization experiments was processed with simulation software to predict an optimized set of conditions. Finally, the predicted conditions were confirmed using the analysis of an herbal supplement obtained from a local drug store.

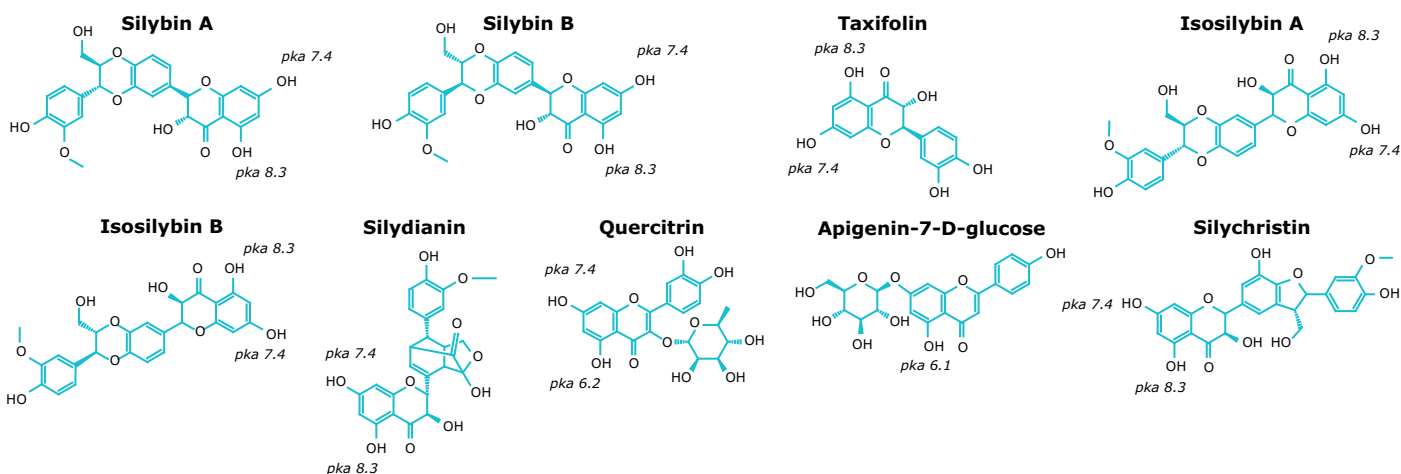


Figure 1.

Structures of known biologically active silymarin components.

Experimental

The screening protocol utilized five Ascentis® Express stationary phases including C18, C8, RP-Amide, Phenyl-Hexyl and pentafluorophenylpropyl (F5). Gradient elution with two distinct organic modifiers was performed. Injections of a standard containing nine of the known constituents of silymarin (Figure 1) were made under each condition.

The HPLC screening method employed gradient elution from 5%–95% of either methanol or acetonitrile. The aqueous component of the mobile phase was 0.1% formic acid (pH 2.6).

In order to optimize the separation, separate chromatographic analysis, at two different gradient slopes, and two temperatures were performed. These four runs were then processed using ACD LC-Simulator software (Toronto, ON, Canada) and a predictive model was used to develop conditions that would provide baseline resolution of all peaks in less than 15 minutes. The conditions were then confirmed, using both standards and a commercially available milk thistle herbal supplement.

Results and Discussion

Using a simple peak counting approach, the combination of the C18 stationary phase along with methanol as the organic modifier resulted in the highest number (nine) of visible peaks. A representative chromatogram is shown in Figure 2. Other combinations of stationary phase and organic modifier produced between six and eight peak responses.

Four separate chromatographic runs using the C18 stationary phase and methanol modifier were conducted, where the gradient slopes were varied (5% and 10% ramp) at two different temperatures (30 °C and 60 °C). The data was then analyzed using ACD LC-Simulator to predict the most suitable optimized conditions. Comparison to the experimental data shown in Figure 3 confirms good agreement between the predicted (not shown) and actual chromatography. Because the suggested conditions ran to just 45% organic, an additional step to 100% organic was included to elute potential hydrophobic components from a natural sample.

Finally, an herbal supplement labeled as containing milk thistle along with dandelion, fennel and licorice was extracted using water:ethanol 50:50, v/v and analyzed. As shown in Figure 4, all 9 of the targeted components could be observed in the herbal supplement material.

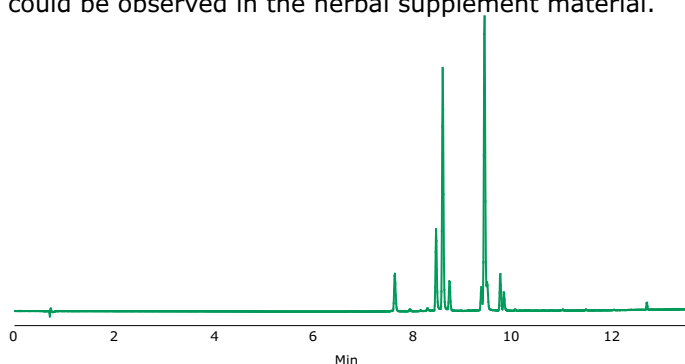


Figure 2.

Initial separation of silymarin components using C18 stationary phase and methanol as the organic modifier.

Column:	Ascentis® Express C18, 10 cm × 3.0 mm I.D., 2.7 µm particle size		
Mobile phase A:	water with 0.1% formic acid		
Mobile phase B:	methanol		
Gradient	min	%A	%B
	0	65	35
	3	65	35
	13	55	45
	15	55	45
Flow Rate:	0.6 mL/min		
Temp.:	35°C		
Det.:	UV, 254 nm		
Injection:	20 µL		
Sample:	9 milk thistle related 20 µg/µL in 86:14, water:methanol		

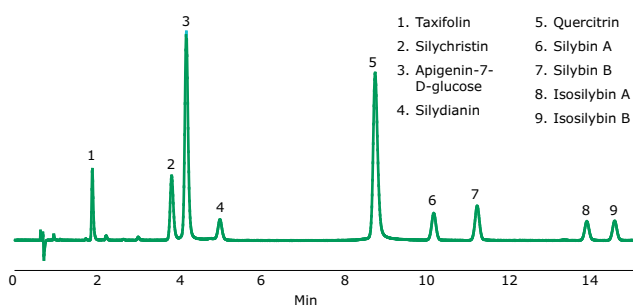


Figure 3.

Experimental confirmation of predicted optimized conditions.

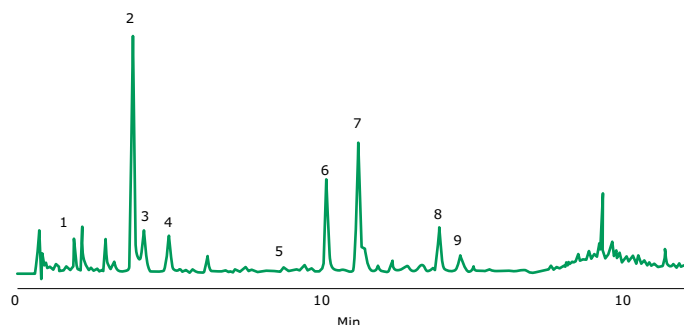


Figure 4.

Identification of silymarin components from a commercial natural supplement.

See Figure 3 for conditions and peak IDs. Sample extracted with 50:50 water:ethanol. Gradient extended to 100% methanol to elute potential hydrophobic sample components.

Conclusions

Stationary phase screening at the onset of method development, especially when dealing with a complex set of analytes, provides an easy means of analytical method development. As shown in the study, a few short experiments, coupled with powerful prediction software, provided chromatographic conditions suitable for the analysis of biologically active milk thistle components. The conditions that were developed should prove useful in natural supplement, raw material and/or biological monitoring of silymarin complex components. The analytical standards for the analytes described in this article are listed in the table below.

Description	Pack Size	Cat. No.
Apigenin-7-glucoside	10 mg	00720585
Isosilybin A	5 mg	97326
Isosilybin B	5 mg	95684
Quercitrin	25 mg	00740580
Silybin A, primary reference standard	10 mg	02000585
Silybin B	5 mg	59527
Silychristin	10 mg	51681
Silydianin	10 mg	30494
Taxifolin	25 mg	78666

Reference standards for active components of silymarin.

Reference

1. Lee, J. I.; Hsu, B. H.; Wu, D.; Barrett, J. S. Journal of Chromatography A 2006, 1116, 57–68.

2. Separation of the Components of *Withania somnifera* (Ashwagandha)

The dried roots of *Withania somnifera* are the source for Ashwagandha, one of the most popular remedies in traditional Indian medicine (Ayurveda). Ayurvedic medicine is becoming increasingly popular in the western world, too, as reflected by the existence of a United States Pharmacopeia (USP) monograph for powdered Ashwagandha roots² and a British Pharmacopeia (BP) monograph for *W. somnifera* root for use in Traditional Herbal Medicinal Products (THMP).³

The traditionally benign health effects are very diverse and include aphrodisiac, rejuvenative and life-prolonging properties.⁴ Beneficial effects are also supported by recent bioactivity studies: Withaferin A has been shown to have significant anticancer activity in animals.⁵

The characteristic constituents belong to a group of steroidal lactones consisting of a steroidal scaffold attached to a six-membered lactone ring. The structures are shown in Figure 1.

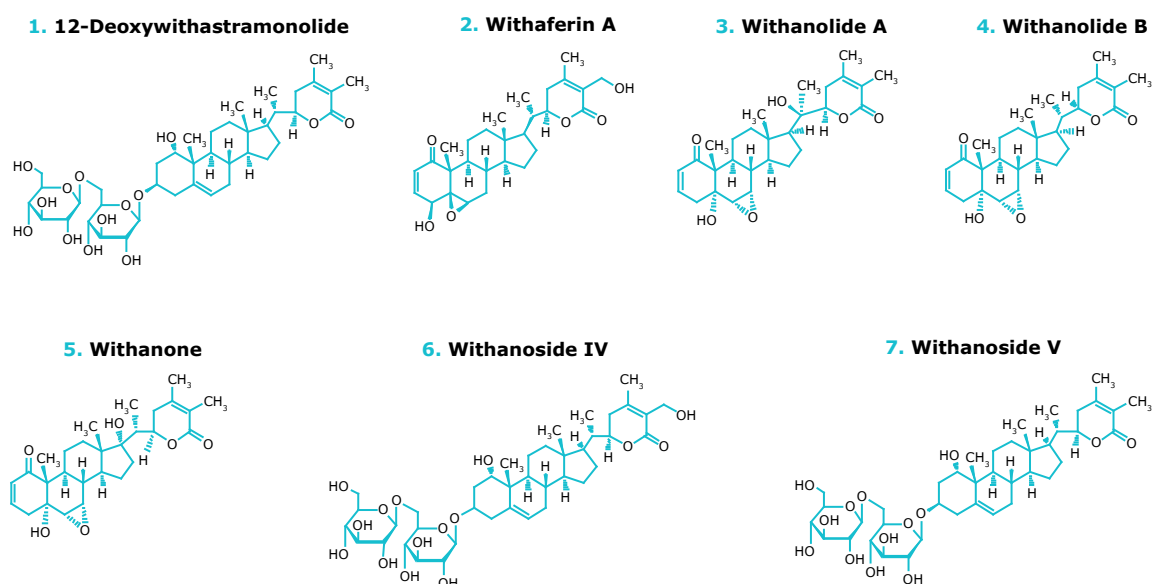


Figure 1.

Structures of Selected *Withania* Constituents.



Fresh Plant



Dried Root

HPLC Analysis of Withania Constituents Using Ascentis® Express Columns

As part of a large number of natural health product studies recently conducted, many of the main constituents of Withania were screened on several modern Fused-Core® stationary phases. The results from the screening effort showed that the Ascentis® Express F5 and the Ascentis® Express Phenyl-Hexyl phases provided improved selectivity over the C18 stationary phase. Both phases, presumably due to their intrinsic rigidity, are known to provide enhanced shape selectivity. The shape selectivity component is often found to be useful for the separation of closely related compounds with rigid structures.

Figure 2 shows a comparison of Withania standard constituents separated using the USP method to an optimized separation with Ascentis® Express Phenyl-Hexyl. The USP method calls for a long, 40-minute gradient and the use of a 25 cm × 4.6 mm C18 column. Even with this lengthy system, only marginal separation of Withanolide A and Withanone is obtained. Conversely, a 15-minute gradient utilizing a shorter 10 cm × 2.1 mm phenyl-hexyl phase provides baseline separation of all components.

Figure 3 shows the separation of Ashwagandha extract constituents using both systems. The use of the phenyl hexyl column is again shown to provide improved resolution in a shorter period of time and with approximately 3x greater sensitivity. Note that only those components that could be confidently identified are noted. Similar results were obtained utilizing the Ascentis® Express F5 stationary phase (data not shown).

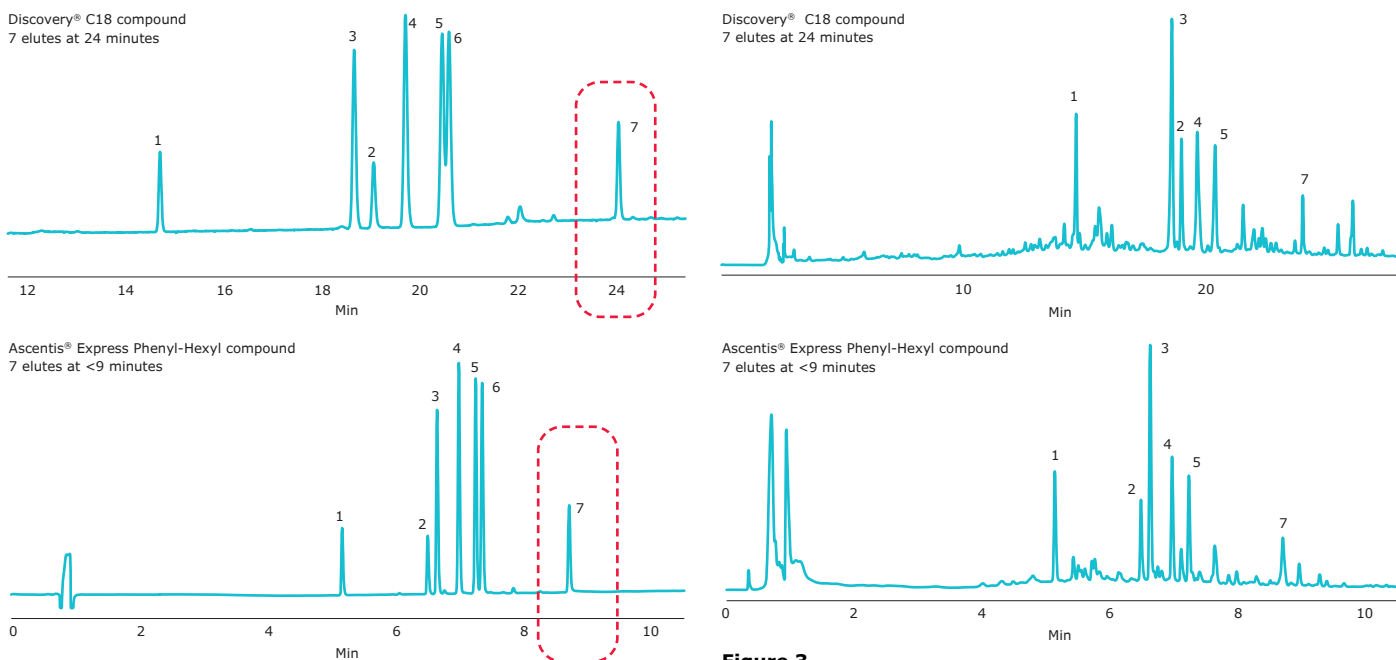


Figure 2.

Comparison of Withania Standard Separation Using a Standard C18 vs Optimized Ascentis® Express Phenyl-Hexyl Method.

Figure 3.

Comparison of Ashwagandha Extract Component Separation Using a Standard C18 vs Optimized Ascentis® Express Phenyl-Hexyl.

Discovery® C18 Conditions for Figures 2 and 3

Column	Discovery® C18, 25 cm × 4.6 mm I.D., 5 µm (504971)		
Mobile phase A	phosphate buffer*		
Mobile phase B	acetonitrile		
Gradient	Min.	%A	%B
	0.0	95.0	5.0
	18.0	55.0	45.0
	25.0	20.0	80.0
	28.0	20.0	80.0
	30.0	95.0	5.0
	40.0	95.0	5.0
Flow rate	1.5 mL/min.		
Temp.	27°C		
Det.	227 nm		
Injection	20 µL		
Samples	Standard: 20 µg/mL each in 80:20 water:methanol		
Extract	As per USP (1)		

*Dissolve 0.14 g of potassium dihydrogen phosphate in 900 mL water, add 0.5 mL of phosphoric acid, dilute with water to 1000 mL, and mix.

Ascentis® Express Phenyl-Hexyl Conditions

Column	Ascentis® Express Phenyl-Hexyl, 10 cm × 2.1 mm I.D., 2.7 µm (53336-U)		
Mobile phase A	water		
Mobile phase B	acetonitrile		
Gradient	Min.	%A	%B
	0.0	80.0	20.0
	10.0	0.0	100.0
	10.5	0.0	100.0
	11.0	20.0	80.0
	15.0	20.0	80.0
Flow rate	0.3 mL/min.		
Temp.	35°C		
Det.	227 nm		
Injection	5 µL		
Samples	same as Discovery® C18		

Conclusion

A fast method with full resolution of 7 constituents from the Ashwagandha root was achieved on an Ascentis® Express Phenyl-Hexyl Fused-Core particle column.

Description	Pack Size	Cat. No.
12-Deoxywithastramonolide	10 mg	94187
Withaferin A	10 mg	89910
Withanolide A	10 mg	74776
Withanolide B	10 mg	94284
Withanone	10 mg	90896
Withanoside IV	10 mg	94186
Withanoside V	10 mg	66042
Ascentis® Express Phenyl-Hexyl Column 10 cm × 2.1 mm I.D., 2.7 µm	—	53336-U

Standards and columns used for this application.

References

1. USP 34, Dietary Supplements, Ashwagandha 1079.
2. BP 2011, Withania somnifera roots for THMP, 3674.
3. Agarwal, A.; Murali, B.; "Quality Assessment of Selected Indian Medicinal Plants"; Volume 1.
4. Singh, G.; Sharma, P.K.; Dudhe, R.; Singh, S.; Annals of Biological Research, 1 (3); 56–63.

3. Separation of the Components of Boswellia (Frankincense)

The trees of the genus boswellia have been used in traditional medicine for thousands of years as an anti-inflammatory agent. Its resin is known as frankincense or olibanum and is still widely used in dietary supplements and in herbal medicinal products. The most characteristic components are a group of pentacyclic triterpene acids of which β -boswellic acids are the major biologically active constituents. We offer six boswellic acids as analytical standards and two neat standards of α + β mixtures for use in research and quality control.

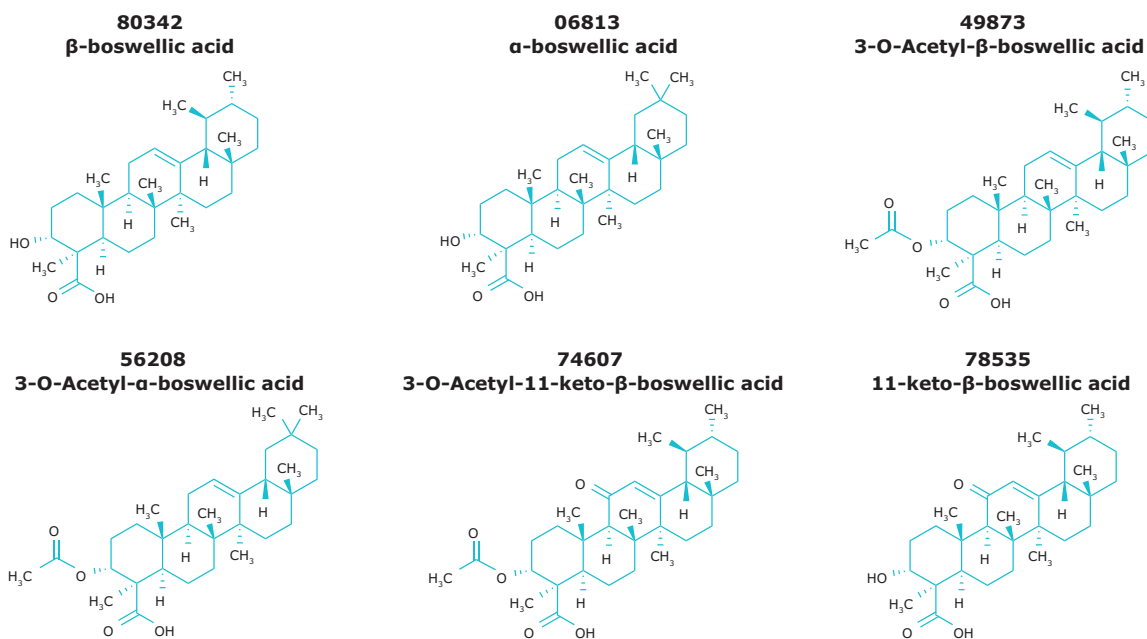


Figure 1.
Chemical Structures of the Boswellic Acids



Separation of Boswellic Acids

Several conditions, using a variety of solid phases, have been screened for their suitability to separate six boswellic acids. The shortest analysis time was achieved using an Ascentis® Express Phenyl Hexyl Column (2.7 µm particle size, L × I.D. 10 cm × 3.0 mm) and acetonitrile/phosphoric acid as eluents.

Figure 2 shows the chromatograms of the ethanolic extract of a boswellia herbal supplement as well as of a mixture of the six analytical standards.

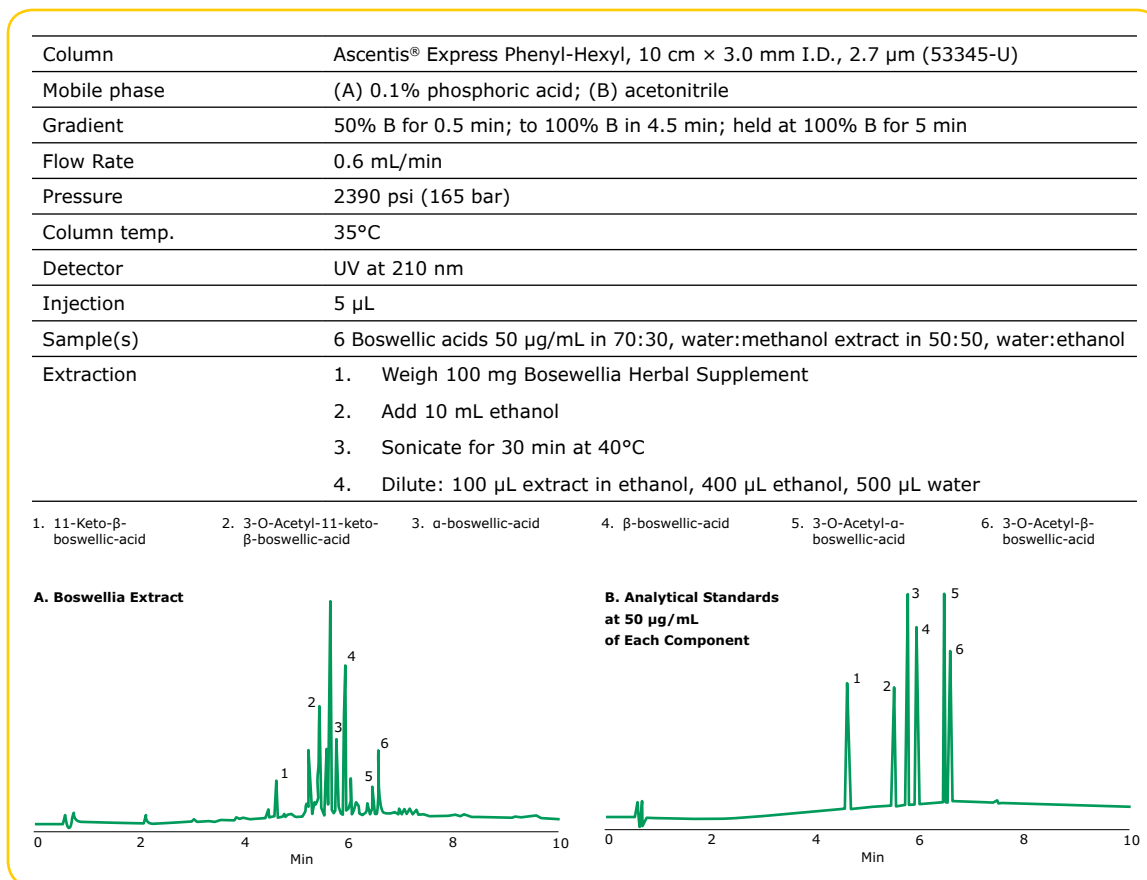


Figure 2.
Experimental Conditions and Chromatograms of the Separation of Boswellic Acids

Description	Pack Size	Cat. No.
3-O-Acetyl-11-keto-β-boswellic acid	5 mg	74607
3-O-Acetyl-α-boswellic acid	5 mg	56208
3-O-Acetyl-β-boswellic acid	5 mg	49873
3-O-Acetylboswellic acid, mixture of α and β	5 mg	96729
α-Boswellic acid	10 mg	06813
β-Boswellic acid	5 mg	80342
Boswellic acid, mixture of α and β	5 mg	63850
11-Keto-β-boswellic acid	5 mg	78535
Ascentis® Express Phenyl-Hexyl, 2.7 Micron HPLC Column	10 cm × 3.0 mm	53345-U

Analytical standards of boswellic acids and column used.

4. Separation of Ginsenosides

Belonging to the plant genus panax, ginseng is one of the most well-known herbal medicines. It has been used in traditional Chinese medicine for centuries, but has also become very popular in the Western world. Medicines derived from the ginseng root are used in the treatment or prevention of many health problems including anxiety, asthma, diabetes, headache, stress, depression and erectile dysfunction, among others.

The unique compounds of panax are saponin triterpenoid glycosides, called ginsenosides. Their potential effects in humans are being studied intensively.

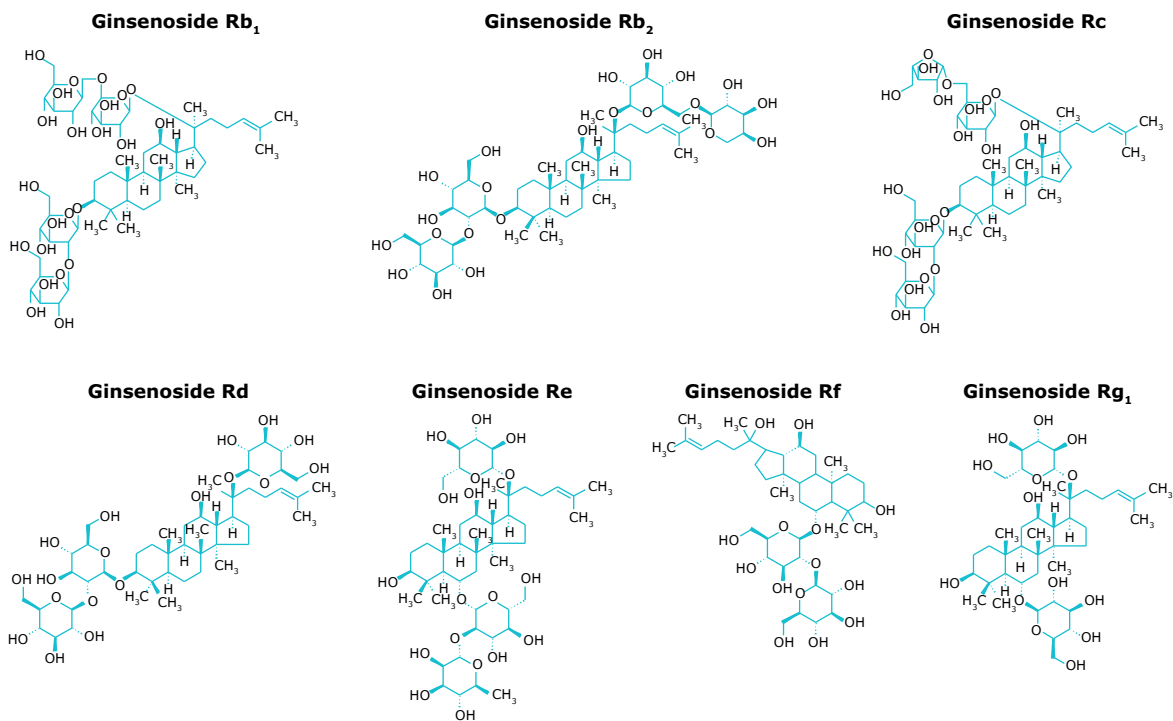


Figure 1.
Chemical structures of the analyzed ginsenosides.



Separation of Ginsenosides in *Panax quinquefolius* (American Ginseng)

We achieved a very good separation of seven different ginsenosides using an Ascentis® Express C18 column. The application was first optimized using a ginsenoside standard mixture (Figure 2) and was then applied to a sample of American ginseng root (Figure 3). The seven targeted analytes are ginsenosides Rb₁, Rb₂, Re, Rc, Rd, Rf and Rg₁ (structures shown in Figure 1). The experimental conditions and chromatograms are shown below.

Experimental Conditions

Column	Ascentis® Express C18 15 cm × 4.6 mm, 2.7 μm particle size		
Mobile phase	(A) water		
Mobile phase	(B) acetonitrile		
Gradient	min	%A	%B
	0	75	25
	1.5	75	25
	13.5	15	85
	14.5	15	85
Flow Rate	1.5 mL/min		
Temp.	60°C		
Detector	205 nm		
Injection	10 μL		

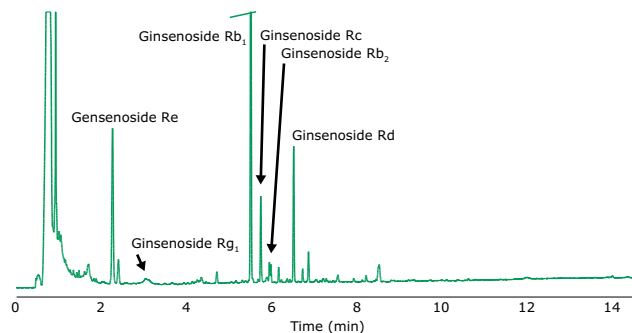


Figure 2.

Chromatogram of the standard mixture (50 μg/mL each component in 82:18, water:methanol).

Extraction method used for ginseng root:

NSF International Ground Plant Material	320 mg (or 36 mg for XRM material)
Extraction Solvent	10 mL 50:50, water:ethanol
Sonication	30 min
Temp.	50°C

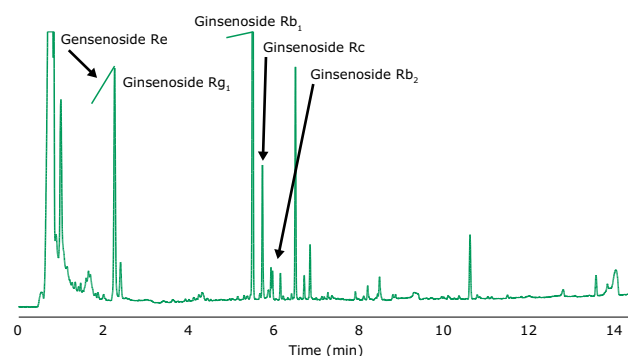


Figure 3.

Chromatogram of the American ginseng root extract.

Description	Pack Size	Cat. No.
Ginsenoside Rb ₁ primary pharmaceutical reference standard	10 mg	00170580
Ginsenoside Rb ₂ analytical standard	10 mg	41868
Ginsenoside Rc analytical standard	10 mg	44987
Ginsenoside Rd analytical standard	10 mg	01518
Ginsenoside Re primary pharmaceutical reference standard	10 mg	03000590
Ginsenoside Rf primary pharmaceutical reference standard	10 mg	01580590
Ginsenoside Rg ₁ primary pharmaceutical reference standard	10 mg	00370580
Ginseng root from <i>Panax quinquefolium</i> (American ginseng)	5 mg	G7253
Ascentis® Express C18 15 cm x 4.6 mm, 2.7 μm particle size	1 EA	53829-U

Products Used.

High Performance Thin Layer Chromatography

HPTLC Fingerprint Applications for *Ginkgo Biloba*

Ginkgo-based products are one of the most commonly used over-the-counter (OTC) herbal preparations for treatment of deficits in memory, concentration and depression from organic brain disease¹. The two main pharmacologically active groups of compounds present in the Ginkgo leaf are the flavonoids and the terpenoids². Another category of constituents, found in the leaves and fruit pods, is called ginkgolic acid, which is toxic and therefore its presence in medicinal products should be avoided.

In the following, we present HPTLC methods suitable for these three compound groups using CAMAG equipment, MilliporeSigma TLC plates, analytical standards and Ginkgo extract reference material 05485001. This extract reference is part of a product group of extract reference materials manufactured by HWI Analytik (**[SigmaAldrich.com/plantextracts](https://www.sigmaaldrich.com/plantextracts)**).

Application Note 1: Flavonoids

Numerous flavonol glycosides were identified in *Ginkgo Biloba* extracts as derivatives of the aglycones, and together they account for 24% of the *Ginkgo* compounds. Flavonols (quercetin, kaempferol and isorhamnetin) are usually found only in small amounts in the leaves³. Moreover, the flavonoid content in the leaf is known to vary between seasons, with greater amounts found in the fall than in the spring⁴.

The quality of *Ginkgo Biloba* extracts is generally evaluated by determination of a minimum content of the terpene lactones and total flavonoids, expressed as the three flavonols (Q/K/I), after hydrolysis of the various flavonol glycosides with acid and heat⁵. Simplification of quality control methods might lead to economically driven adulteration with inexpensive synthetic compounds such as rutin, which, after hydrolysis, is converted into quercetin, or quercetin itself.

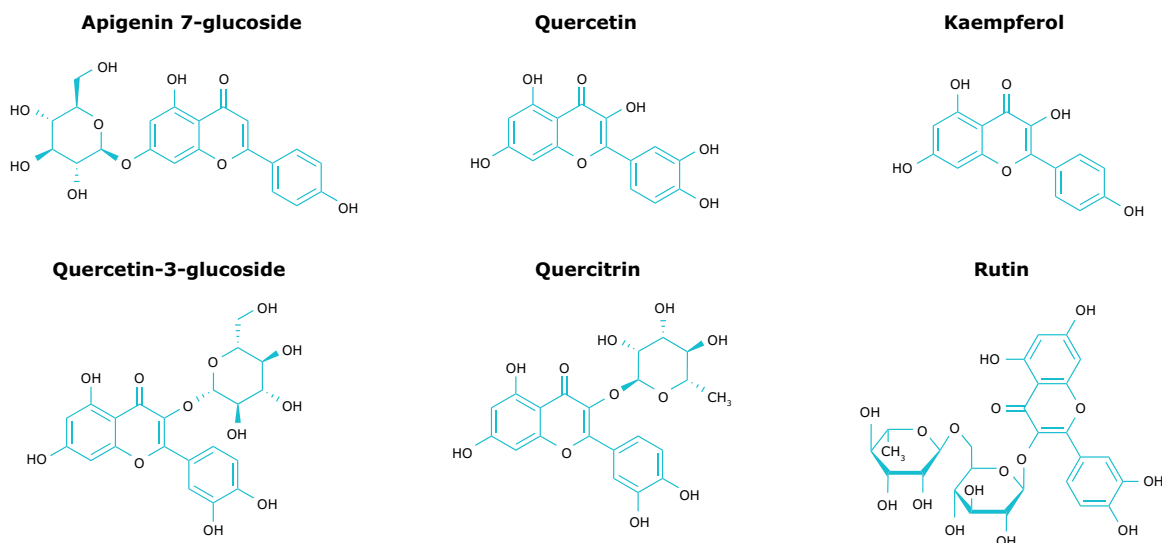


Figure 1.
Flavonoids Present in *Ginkgo Biloba*

Scope:

Identification of flavonoids in the HPTLC fingerprint of *Ginkgo Biloba* extracts and leaf obtained with the HPTLC method of the USP monograph on *Ginkgo* leaf⁶ by comparison of the R_F values of the reference substances and the matching zones in the reference extract.

Recommended CAMAG Devices:

Automatic TLC Sampler 4 (ATS 4) or Linomat 5, Automatic Developing Chamber (ADC 2), TLC Visualizer, Chromatogram Immersion Device, TLC Plate Heater and visionCATS.

Sample:

Drug: In a 25 mL flask, 1 g powdered raw material is refluxed with 10 mL methanol for 10 min. After cooling, the mixture is centrifuged. Extract: 0.1 g of dry extract is sonicated with 10 mL methanol for 10 min and filtered. The supernatant is used as test solution.

Standards:

Standard solutions were prepared in a concentration of 0.25 mg/mL in methanol.

Derivatization Reagent:

Natural Products reagent (NP reagent): 1 g diphenylborinic acid aminoethylester is dissolved in 200 mL ethyl acetate. Polyethylene glycol (PEG reagent): 10 g polyethylene glycol 400 (macrogol) are dissolved in 200 mL dichloromethane.

Chromatography Following USP <203>⁷:

Stationary phase:

HPTLC Si 60 F₂₅₄ 20×10 cm (MilliporeSigma).

Sample application:

3 µL each of test solution and 2 µL of standards are applied as 8 mm bands, 8 mm from lower edge of plate and 20 mm from the left edge, using the ATS 4.

Developing solvent:

Ethyl acetate, glacial acetic acid, formic acid and water (100:11:11:26 v/v/v/v)

Development:

Development was performed with ADC 2, saturated for 20 min. with the mobile phase (filter paper). Prior to the development, the plate was exposed to a relative humidity of 33% (with a saturated solution of MgCl₂).

Developing distance:

70 mm from lower edge of the plate

Plate drying:

5 min in a stream of cold air

Detection:

The plate is heated at 100 °C for 3 min, then dipped (speed: 3, time: 0) while still hot in NP reagent, dried in a stream of cold air, then dipped (speed: 3, time: 0) in PEG reagent

Evaluation:

Documentation under UV 366 nm after derivatization

Results:

Under UV 366 nm after derivatization (Figure 2), the zones corresponding in color and position to the standards rutin, quercetin-3-glucoside, apigenin-7-O-glucoside and quercitrin are seen in all samples in different intensities. The standards quercetin and kaempferol are seen in all three extracts (track 7, our reference extract, track 8 and track 9); however, in different intensities. The extract on track 9 represents a characteristic fingerprint of a sample adulterated with quercetin, kaempferol and isorhamnetin due to the presence of an intense yellow/green zone at the position of quercetin and kaempferol (just below the solvent front). Ginkgo leaf (track 10) shows a fingerprint similar to the reference extract on track 7; however, due to the extraction processes and chlorophylls, the red zone at the solvent front is not seen in the reference extract. The fingerprint on track 11 is characteristic of golden fall ginkgo.

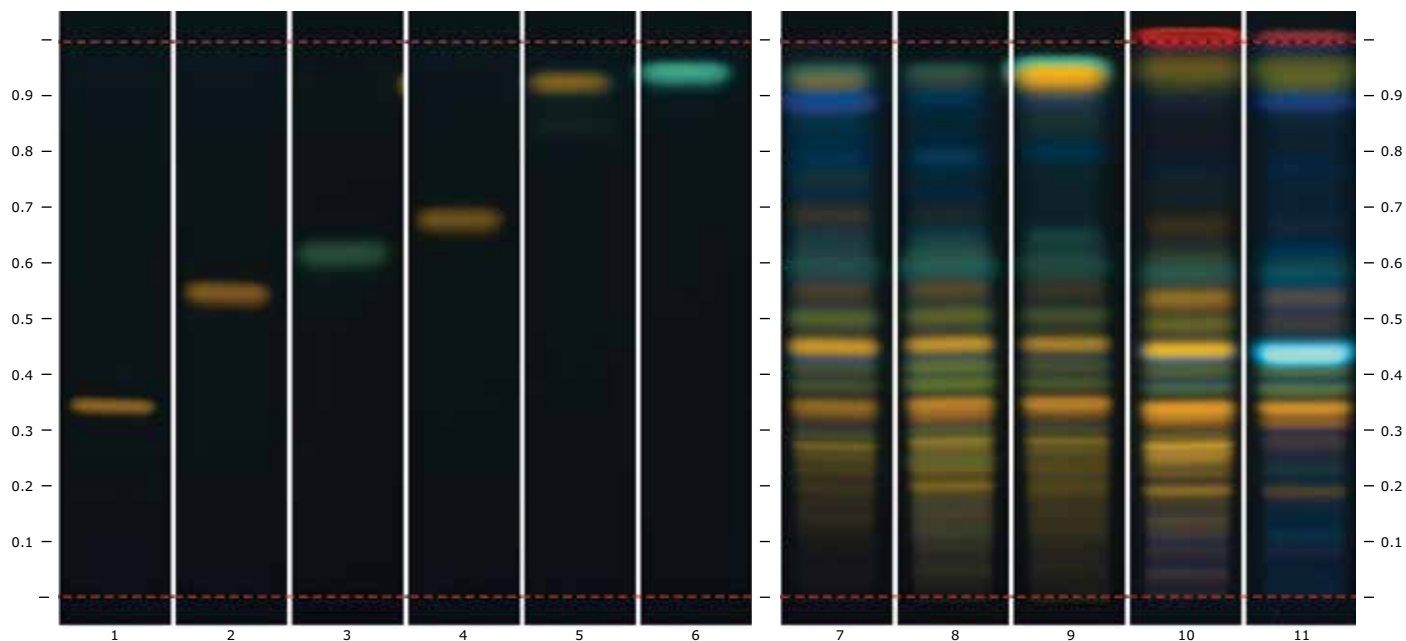


Figure 2.

Chromatogram under UV 366 nm after Derivatization. Track 1: Rutin; Track 2: Quercetin-3-glucoside; Track 3: Apigenin-7-O-glucoside; Track 4: Quercitrin; Track 5: Quercetin; Track 6: Kaempferol; Track 7: *G. Biloba* Leaf Powdered Extract 05485001; Track 8: *G. Biloba* Leaf Dry Extract; Track 9: *G. Biloba* Leaf Dry Extract Adulterated with Quercetin; Track 10: *G. Biloba* Powdered Leaf; Track 11: *G. Biloba* Powdered Leaf (Golden Ginkgo)

Application Note 2: Ginkgo Terpene Lactones

Two types of terpenoids are present in ginkgo as lactones: ginkgolides and bilobalides (see Figure 3). Together they account for 6% of the ginkgo compounds and are present only in this species^{2, 8}. Due to the low UV absorption of the terpene lactones, HPLC analyses require special detectors⁹. For detection in HPTLC, only a simple derivatization step is required.

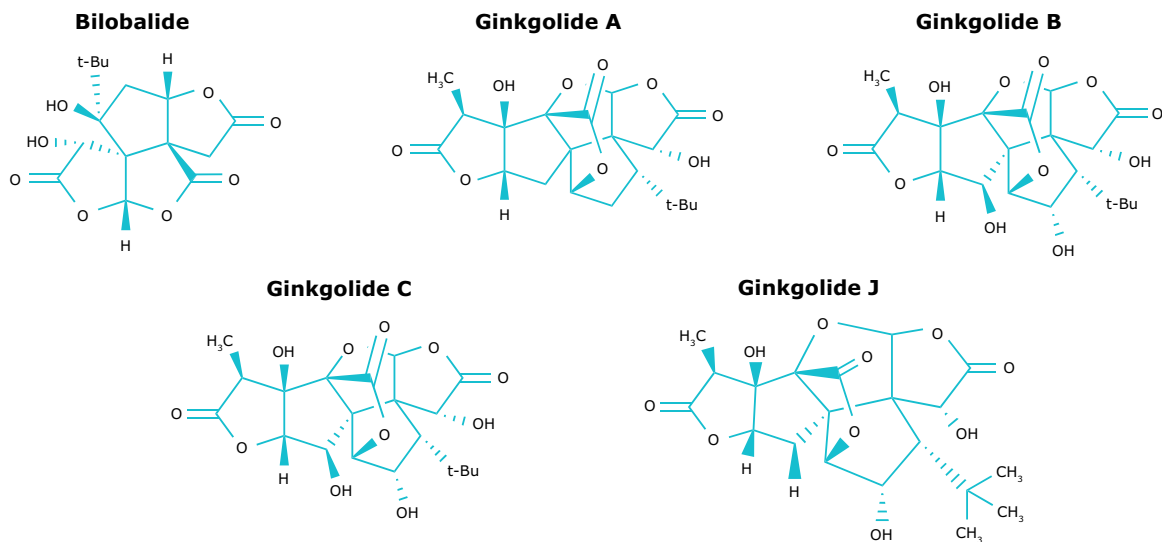


Figure 3.
Ginkgolide and Bilobalide Lactones Present in *Ginkgo Biloba*

Scope:

Identify the presence of ginkgolides (A, B, C and J) and bilobalide in the fingerprints of *Ginkgo Biloba* extracts and leaf obtained with the HPTLC method of the USP monograph for ginkgo leaf by comparison of the R_F values of the reference substances and the matching zones in the reference extract.

Required or Recommended CAMAG Devices:

Automatic TLC Sampler 4 (ATS 4) or Linomat 5, Automatic Developing Chamber (ADC 2), TLC Visualizer, TLC/HPTLC Sprayer or CAMAG Derivatizer, TLC Plate Heater and visionCATS.

Sample:

Drug: In a 25 mL flask, 1 g powdered raw material is refluxed with 10 mL methanol for 10 min. After cooling, the mixture is centrifuged. Extract: 0.1 g of dry extract is sonicated with 10 mL methanol for 10 min and filtered. The supernatant is used as test solution.

Standards:

Standard solutions were prepared in a concentration of 1.0 mg/mL in methanol.

Plate Impregnation with Sodium Acetate Solution:

8 g of sodium acetate are dissolved in 200 mL of ethanol, water (3:2 v/v). HPTLC plates are immersed into the solution for 2 seconds and allowed to dry at room temperature in the hood for 5 min. The plates are then heated at 90 °C for 30 min.

Derivatization Reagent:

Acetic anhydride is directly used for spraying.

Chromatography Following USP <203>⁶:

Stationary phase:

HPTLC Si 60 F₂₅₄ 20×10 cm (MilliporeSigma).

Sample application:

5 µL each of test solution and 3 µL of standards are applied as 8 mm bands, 8 mm from lower edge of plate and 20 mm from the left edge using the ATS 4.

Developing solvent:

Toluene, ethyl acetate, acetone, methanol (20:10:10:1.2 v/v/v/v).

Development:

Development is performed with ADC 2, saturated for 20 minutes with the mobile phase (filter paper). Prior to the development, the plate is exposed to a relative humidity of 33% (with a saturated solution of MgCl₂).

Developing distance:

70 mm from lower edge of the plate.

Plate drying:

5 min in a stream of cold air.

Detection:

The plate is sprayed evenly with acetic anhydride and heated at 180 °C for 10 min.

Evaluation: Documentation under UV 366 nm after derivatization.

Results:

In Figure 4, the zones, due to the standards Ginkgolides C, J, B, A and Bilobalide, are seen in both extracts (track 6, our reference extract from HWI Analytik, and track 7). These zones are barely seen in leaf (track 8) due to the presence of a matrix that disturbs the chromatogram.

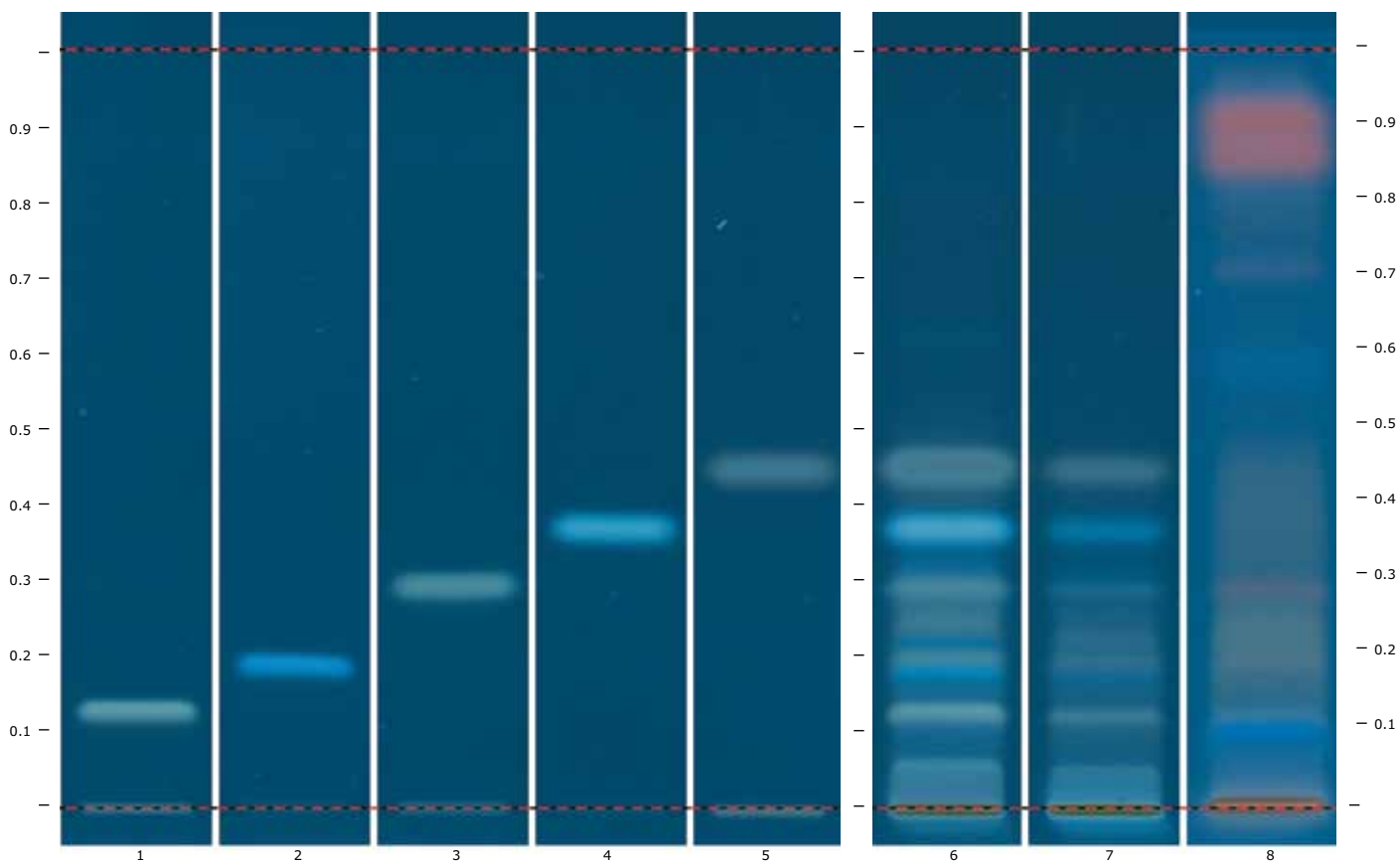


Figure 4.

Chromatogram under UV 366 nm after Derivatization. Track 1: Ginkgolide C; Track 2: Ginkgolide J; Track 3: Ginkgolide B; Track 4: Ginkgolide A; Track 5: Bilobalide; Track 6: *G. Biloba* Leaf Powdered Extract 05485001; Track 7: *G. Biloba* Leaf Dry Extract; Track 8: *G. Biloba* Powdered Leaf

Application Note 3: Ginkgolic Acids

The compound class of ginkgolic acids can have toxic effects such as allergies¹⁰⁻¹¹; therefore, during the preparation of ginkgo-based products, except for the crude drug products, the undesired ginkgolic acids are usually eliminated¹².

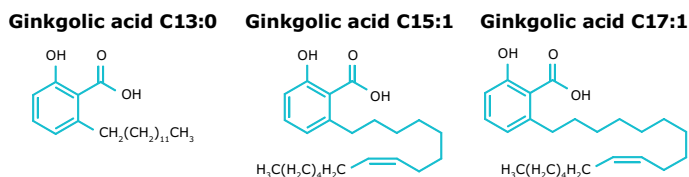


Figure 5.

Ginkgolic Acids Present in *Ginkgo Biloba*

Scope:

Identification of ginkgolic acids (C15:1, C13:0 and C17:1) in the HPTLC fingerprint of *Ginkgo Biloba* extracts and leaf obtained with the HPTLC method of the HPTLC Association¹³ on ginkgo leaf by comparison of the R_f values of the reference substances and the matching zones in the reference extract.

Required or Recommended CAMAG Devices:

Automatic TLC Sampler 4 (ATS 4) or Linomat 5, Automatic Developing Chamber (ADC 2), TLC Visualizer and visionCATS.

Sample:

Drug: In a 25 mL flask, 1 g powdered raw material is refluxed with 10 mL methanol for 10 min. After cooling, the mixture is centrifuged. Extract: 0.1 g of dry extract is sonicated with 10 mL methanol for 10 min and filtered. The supernatant is used as test solution.

Standards:

Standard solutions were prepared in a concentration of 0.4 mg/mL in methanol.

Chromatography Following USP <203>⁷:

Stationary phase:

HPTLC Si 60 F₂₅₄ 20×10 cm (MilliporeSigma).

Sample application:

5 µL each of test solution and standards are applied as 8 mm bands, 8 mm from lower edge of plate and 20 mm from the left edge using the ATS 4.

Developing solvent:

Toluene, ethyl acetate, glacial acetic acid (40:10:1 v/v/v).

Development:

Development is performed with ADC 2, saturated for 20 min with the mobile phase (filter paper). Prior to the development, the plate was exposed to a relative humidity of 33% (with a saturated solution of MgCl₂).

Developing distance:

70 mm from lower edge of the plate.

Plate drying:

5 min in a stream of cold air.

Evaluation:

Documentation under UV 366 nm.

Results:

As observed in Figure 6, only the *G. Biloba* powdered leaf sample (track 6) shows a wide blue fluorescent zone due to unresolved ginkgolic acids between R_f s 0.38 and 0.49.

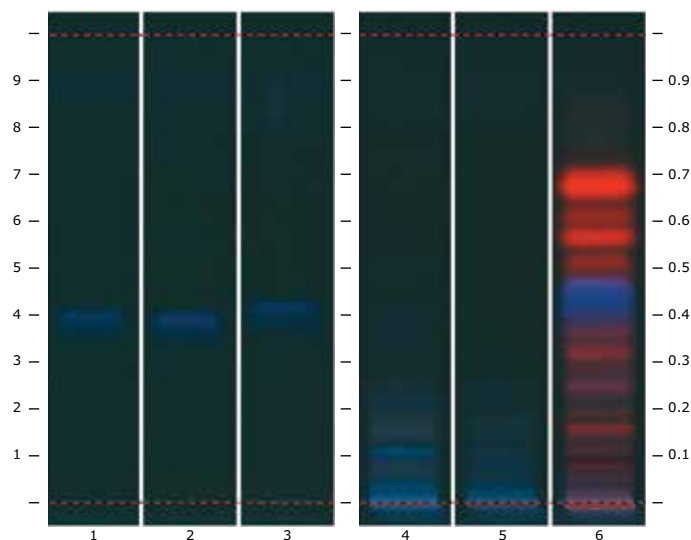


Figure 6.

Chromatogram under UV 366 nm. Track 1: Ginkgolic Acid C15:1; Track 2: Ginkgolic Acid C13:0; Track 3: Ginkgolic Acid C15:1; Track 4: *G. Biloba* Leaf Powdered Extract 05485001; Track 5: *G. Biloba* Leaf Dry Extract; Track 6: *G. Biloba* Powdered Leaf

Conclusions:

The examples shown above demonstrate that HPTLC is a very powerful and efficient tool for fast analysis of complex compound mixtures such as plant materials. Besides consuming little time and low quantities of solvents, the method allows for simultaneous analysis of multiple samples and in addition does not require a time-consuming sample preparation procedure, thus making HPTLC a valuable alternative to other chromatographical methods. Further information on instrumentation for HPTLC can be found at:

www.camag.com

MilliporeSigma is very proud to offer all consumables needed for the described applications including reference materials and TLC plates ready from stock. Find all used products listed below.

Product Group	Description	Package Size	Cat. No.
Flavonoids	Apigenin 7-glucoside	10 mg	00720585
	Kaempferol	10 mg	00550580
	Quercetin	50 mg	00200595
	Quercetin 3-glucoside	10 mg	16654
	Quercitrin	25 mg	00740580
Ginkgolic Acids	Rutin	25 mg	78095
	Ginkgolic acid C13:0	10 mg	49962
	Ginkgolic acid C15:1	10 mg	02580585
Terpene Lactones	Ginkgolic acid C17:1	10 mg	01390590
	(-)-Bilobalide	10 mg	00760595
	Ginkgolide A	25 mg	00770590
	Ginkgolide B	10 mg	94970
	Ginkgolide C	25 mg	01490590
	Ginkgolide J	5 mg	89556

Table 1.

Analytical Standards Used for Applications

Description	Quantitative Markers	Qualitative Markers	Package Size	Cat. No.
<i>Ginkgo Biloba</i> extract	Bilobalide, Ginkgolide A	Bilobalide, Ginkgolide A, Ginkgolide B, Ginkgolide C	150 mg	05485001

Table 2.

Ginkgo Plant Extract Reference Material Used for Applications

Description	Dimensions	Package Size	Cat. No.
HPTLC glass plate Silica gel 60 F ₂₅₄	20×10 cm	50 Plates	1.05642.0001

Table 3.

TLC Plates Used for Applications

SigmaAldrich.com/phytochemicals

A list of our complete offering of phytochemical standards can be found at SigmaAldrich.com/medicinalplants and all our extract reference materials including an example certificate can be viewed here: SigmaAldrich.com/plantextracts. All plant extract reference materials are delivered with a certificate giving the exact mass fractions for the quantitative markers. Additional qualitative markers are confirmed. A chromatographical method is also provided, including a chromatogram with peak assignment.

HPTLC plates from MilliporeSigma enable significant faster results at high precision in outstanding quality.

Learn more about the features of High Performance Thin Layer Chromatography plates at EMDMillipore.com/hptlc

References:

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Index by Plant Genus

On the following pages, a list of almost 100 of the most widely used medicinal plant genera are listed, showing the most relevant constituents that can be used as analytical markers for each corresponding plant.

Compound	Cat. No.
Acacia sp.	
Apigenin 7-glucoside*	00720585
Apigenin 7-glucoside	44692
Catechin 5-O-gallate	89106
(+)-Catechin*	03910590
(+)-Catechin	43412
3,3'-Di-O-methylelagic acid 4'-xylopyranoside	90905
Epicatechin*	03940590
(-)-Epicatechin	68097
Epicatechin 3-gallate (-)*	03950590
Epigallocatechin gallate*	03970590
(-)-Epigallocatechin gallate	93894
Gallic acid**	91215
(-)-Galocatechin	01388
Geraniol	48798
Hordeinone	61207
Hyperoside*	00180585
Isovitexin*	01120590
Isovitexin	67135
Luteolin 7-glucoside*	03600585
Luteolin 7-glucoside	49968
(±)-Naringenin	52186
Oleanolic acid*	03920590
Oleanolic acid	42515
p-Hydroxybenzoic acid	PHR1048
Quercetin 3-glucoside	16654
Quercetin dihydrate*	00200595

Compound	Cat. No.
Quercitrin*	00740580
Rutin trihydrate*	00300590
Salicylic acid**	52341
Spiraeoside	91802
(+)- α -Terpineol	83073
Vitexin*	00840595
Vitexin	49513
Achillea sp.	
Apigenin*	01760595
Apigenin	42251
Apigenin 7-glucoside*	00720585
Apigenin 7-glucoside	44692
(-)-Bornyl acetate	45855
Casticin	16382
Chamazulen	91595
1,5-Dicaffeoylquinic acid	16917
(-)- β -Elemene	63965
Eucalyptol (1,8-Cineole)**	95656
Eucalyptol (1,8-Cineole)*	00020590
Eucalyptol (1,8-Cineole)	29210
Luteolin*	03880590
Luteolin	72511
Luteolin 7-glucoside*	03600585
Luteolin 7-glucoside	49968
Rutin trihydrate*	00300590
Scopoletin	38332

*Primary pharmaceutical reference standard HWI
**TraceCERT®, certified reference material

Compound	Cat. No.
Aesculus sp.	
Allantoin	93791
Esculin hydrate	06212
Fraxin	80533
Kaempferol*	00550580
Kaempferol	96353
Quercetin dihydrate*	00200595
Allium sp.	
(+)-L-Alliin	72805
<i>trans</i> -Ferulic acid**	52229
Kaempferol*	00550580
Kaempferol	96353
Kaempferol 3-glucoside	68437
Protocatechuic acid*	03930590
Protocatechuic acid	08992
Quercetin 3-glucoside	16654
Quercetin dihydrate*	00200595
Resorcinol**	53363
Spiraeoside	91802
Aloe sp.	
Aloe-emodin	93938
Aloenin A	41757
Aloin A	50292
Chrysophanol	01542
Salicylic acid**	52341
Ammi sp.	
Khellin	00899
Anacardium sp.	
(15:0)-Anacardic acid	05506
Cardanol	04016
5-Pentadecylresorcinol	91822
Protocatechuic acid*	03930590
Protocatechuic acid	08992
Andrographis sp.	
Andrograpanin	19443
Andrographolide	90281
14-Deoxy-11,12-didehydroandrographolide	55549
7-O-Methylwogonin	41442
Neoandrographolide	49879
Angelica sp.	
Angelicin	18118
Bergapten	69664
(-)- α -Bisabolol*	00320188

Compound	Cat. No.
(-)- α -Bisabolol	95426
(+)-Borneol	68878
Biacangelicin	77686
<i>trans</i> -Caffeic acid**	51868
Camphor (dl)*	02070595
Camphene	442505
Chlorogenic acid*	00500590
Eucalyptol (1,8-Cineole)**	95656
Eucalyptol (1,8-Cineole)*	00020590
Eucalyptol (1,8-Cineole)	29210
Eugenol**	79891
Eugenol*	01050595
Eugenol	35995
<i>trans</i> -Ferulic acid**	52229
Fumaric acid**	76635
8-Geranyloxypsoralen	40594
Hesperidin	50162
Isoimperatorin	68771
Isopimpinellin	61419
(-)- α -Pinene	80599
α -Pinene*	00040590
(+)- β -Pinene	80607
Psoralen	73633
Quercetin 3-glucoside	16654
Quercetin dihydrate*	00200595
Scopoletin	38332
Umbelliferone	54826
Vanillic acid**	68654
Xanthotoxin	56448
Arctostaphylos sp.	
Arbutin	66468
(+)-Catechin*	03910590
(+)-Catechin	43412
Corilagin	75251
Ellagic acid	14668
Gallic acid**	91215
Hydroquinone	74347
Hyperoside*	00180585
Myricetin	72576
Myricitrin	67268
Protocatechuic acid*	03930590
Protocatechuic acid (3,4-Dihydroxybenzoic acid)	08992
Quercetin 3-glucoside	16654

*Primary pharmaceutical reference standard HWI
**TraceCERT®, certified reference material

Phytochemical Standards

Compound	Cat. No.
Quercetin dihydrate*	00200595
Quercitrin*	00740580
Rutin trihydrate*	00300590
Ursolic acid*	03240595
Ursolic acid	89797
Armoracia sp.	
(-)-Sinigrin hydrate	00290
Arnica sp.	
Chlorogenic Acid*	00500590
Cynarin	91801
1,5-Dicaffeoylquinic acid	16917
Isoquercitrin*	00140585
Kaempferide	69545
Mataresinol	04157
Naringenin 4',7-dimethylether	76716
Quercetin 3-glucoside	16654
Quercetin dihydrate*	00200595
(-)- α -Santonin	53653
Artemisia sp.	
Artemisinin	69532
(-)- α -Bisabolol*	00320188
(-)- α -Bisabolol	95426
(+)-Borneol	68878
(-)-Bornyl acetate	45855
Camphor (dl)*	02070595
Camphene	442505
Casticin	16382
Chlorogenic acid*	00500590
Cirsilineol	67403
Eucalyptol (1,8-Cineole)**	95656
Eucalyptol (1,8-Cineole)*	00020590
Eucalyptol (1,8-Cineole)	29210
Eupalitin	66324
Isofraxidin	91214
Matricin	77347
Naringenin 4',7-dimethylether	76716
α -Pinene	80599
α -Pinene*	00040590
Resorcinol**	53363
Rutin trihydrate	00300590
Scopoletin	38332
Sesamin	59867

*Primary pharmaceutical reference standard HWI

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Compound	Cat. No.
Aspalathus sp.	
Aspalathin	03520585
Orientin	55736
Quercetin 3-glucoside	16654
Quercitrin	00740580
Asparagus sp.	
Chelidonic acid	49526
Hyperoside	00180585
Quercetin 3-glucoside	16654
Rutin trihydrate*	00300590
Shatavarin IV	30151
Azadirachta sp.	
2',3'-Dehydrosalannol	80098
Kaempferol*	00550580
Kaempferol	96353
Quercetin dihydrate*	00200595
Bacopa sp.	
Bacopasaponin C	76092
Bacopaside I	56619
Bacopaside X	42488
Bacopaside-II	44698
Bacoside A, mixture of Bacoside A3, Bacopaside II, Bacopaside X and Bacopasaponin C	76091
Bacoside A3	53889
Bacosine	69528
Apigenin 7-glucoside*	00720585
Apigenin 7-glucoside	44692
Genistein	92136
Kaempferol*	00550580
Kaempferol	96353
Luteolin 7-glucoside*	03600585
Luteolin 7-glucoside	49968
Quercetin 3-glucoside	16654
Quercetin dihydrate*	00200595
Rutin trihydrate*	00300590
Scopoletin	38332
Tectoridin	89948
Tectorigenin	67359
Betula sp.	
Betulin	92648
Betulin 3,28-diacetate	59919
Betulonic acid	91466
<i>trans</i> -Caffeic acid**	51868

Compound	Cat. No.
(+)-Catechin*	03910590
(+)-Catechin	43412
Chlorogenic Acid*	00500590
Hyperoside*	00180585
Lupeol	18692
Myricitrin*	02180585
Myricitrin	67268
Pyrogallol	06931
Quercetin 3-glucuronide*	00310590
Quercetin 3-O-glucuronide	90733
Quercitrin*	00740580
Rutin trihydrate*	00300590
Salicylic acid**	52341
Scutellarin	73577
Vanillic acid**	68654
Boerhaavia sp.	
Boeravinone B	96844
Eupalitin	66324
Eupalitin 3-O β -D-galactopyranoside	89165
Boswellia sp.	
3-O-Acetyl- β -boswellic acid	49873
3-O-Acetyl-11-keto- β -boswellic acid	74607
3-O-Acetyl- α -boswellic acid	56208
3-O-Acetylboswellic acid, mixture of α and β	96729
(+)-Borneol	68878
(-)-Bornyl acetate	45855
β -Boswellic acid	80342
Boswellic acid, mixture of α and β	63850
α -Boswellic acid	06813
(+)-Catechin*	03910590
(+)-Catechin	43412
Elemolic acid, mixture of α and β	73527
β -Elemonic acid	00708
11-Keto- β -boswellic acid	78535
Lupeol	18692
α -Pinene	80599
α -Pinene*	00040590
Serratol	78689
Brassica sp.	
<i>trans</i> -Ferulic acid**	52229
Lutein	07168
<i>trans</i> -Sinapic acid	93878
(-)-Sinigrin hydrate	00290

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Compound	Cat. No.
Calendula sp.	
Allantoin	93791
<i>trans</i> -Caffeic acid**	51868
<i>trans</i> - <i>p</i> -Coumaric acid	55823
<i>trans</i> -Ferulic acid**	52229
Hyperoside*	00180585
Isorhamnetin	38907
Oleanolic acid*	03920590
Oleanolic acid	42515
Protocatechuic acid*	03930590
Protocatechuic acid	08992
Quercetin 3-glucoside	16654
Quercetin dihydrate*	00200595
Rutin trihydrate*	00300590
Scopoletin	38332
Umbelliferone	54826
Camellia sp.	
Camellia sinensis extract	05495001
<i>trans</i> -Caffeic acid**	51868
Caffeine**	56396
(+)-Catechin*	03910590
(+)-Catechin	43412
<i>trans</i> - <i>p</i> -Coumaric acid	55823
Epigallocatechin	03960590
(-)-Epigallocatechin*	08108
Gallic acid**	91215
(-)-Gallocatechin	01388
(-)-Gallocatechin gallate	80352
Theaflavin	55016
Theaflavin monogallate	53963
Theaflavin 3,3'-digallate	92223
Theophylline	PHR1023
Cannabis sp.	
Hordenine	61207
Isovitexin*	01120590
Isovitexin	67135
Methyl eugenol	04607
α -Pinene	80599
α -Pinene*	00040590
(+)- β -Pinene	80607
Tetrahydrocannabinol(delta9)	56296
Trigonelline hydrochloride	61407
Vitexin*	00840595
Vitexin	49513

Phytochemical Standards

Compound	Cat. No.
Capsicum sp.	
Apigenin*	01760595
Apigenin	42251
Capsaicin	12084
Dihydrocapsaicin	03813
Esculin hydrate	06212
Isovitexin*	01120590
Isovitexin	67135
Luteolin 7-glucoside*	03600585
Luteolin 7-glucoside	49968
N-Vanillylnonamide	15971
Orientin*	03810585
Orientin	55736
Scopoletin	38332
Vitexin*	00840595
Vitexin	49513
Carica sp.	
Eucalyptol (1,8-Cineole)**	95656
Eucalyptol (1,8-Cineole)*	00020590
Eucalyptol (1,8-Cineole)	29210
Geraniol	48798
Carum sp.	
Bergapten	69664
(-)-Carveol, mixture of isomers	61370
(-)-Carvone*	00290595
(+)-Carvone**	79245
(+)-Carvone	22070
Chlorogenic acid*	00500590
Cryptochlorogenic acid	90467
(+)-Dihydrocarvone, mixture of isomers	09164
(R)-(+)-Limonene	62118
Neochlorogenic acid	91213
Protocatechuic acid*	03930590
Protocatechuic acid (3,4-Dihydroxybenzoic acid)	08992
Quercetin 3-glucoside	16654
Quercetin dihydrate*	00200595
Quercetin 3-glucuronide*	00310590
Quercetin 3-O-glucuronide	90733
Salicylic acid**	52341
<i>trans</i> -Sinapic acid	93878
Vanillic acid**	68654
Xanthotoxin	56448

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Compound	Cat. No.
Cassia sp.	
Aloe-emodin	93938
(+)-Catechin*	03910590
(+)-Catechin	43412
Chrysophanol	01542
Dihydrokaempferol	92204
Emodin	30269
Isorhamnetin	38907
Kaempferol*	00550580
Kaempferol	96353
Physcion	93893
Rhein	30873
Rubiadin	74553
Sennoside A*	01870575
Sennoside B*	00530580
Sennosid C	73235
Sennoside D	16383
Chamomilla sp.	
Apigenin*	01760595
Apigenin	42251
Apigenin 7-glucoside*	00720585
Apigenin 7-glucoside	44692
(-)- α -Bisabolol*	00320188
(-)- α -Bisabolol	95426
Bisabolol oxide A*	00630590
Bisabolol oxide A	59761
(+)-Borneol	68878
(-)-Bornyl acetate	45855
<i>trans</i> -Caffeic acid*	51868
Chamazulen	91595
Luteolin*	03880590
Luteolin	72511
Matricin	77347
Quercetin dihydrate*	00200595
Umbelliferone	54826
Vanillic acid**	68654
Cichorium sp.	
<i>trans</i> -Caffeic acid**	51868
Caftaric acid	88656
(-)-Chicoric acid	06957
Chlorogenic acid*	00500590
<i>trans</i> -p-Coumaric acid	55823

Compound	Cat. No.
Esculin hydrate	06212
<i>trans</i> -Ferulic acid**	52229
Hyperoside*	00180585
Isorhamnetin	38907
Kaempferol 3-glucoside	68437
Quercetin 3-glucoside	16654
Quercetin 3-glucuronide*	00310590
Quercetin 3-O-glucuronide	90733
Quercitrin*	00740580
Scopoletin	38332
Umbelliferone	54826
Cimicifuga sp.	
Friedelin	92187
Kaempferol*	00550580
Kaempferol	96353
Cinchona sp.	
Epiquinidine	00998
Epiquinine	89457
Cinnamomum sp.	
Quinine**	69311
Benzyl benzoate**	55177
Benzyl benzoate	68183
(+)-Borneol	68878
<i>trans</i> -Caffeic acid**	51868
Camphor (dl)*	02070595
Camphene	442505
(-)- <i>trans</i> -Caryophyllene	75541
(+)-Catechin*	03910590
(+)-Catechin	43412
<i>trans</i> -Cinnamaldehyde	06536
<i>trans</i> -Cinnamic acid	97013
Cinnamyl acetate	42759
Cinnamyl alcohol	93066
<i>m</i> -Coumaric acid	92649
<i>trans-p</i> -Coumaric acid	55823
Coumarin**	72609
Coumarin*	01260595
Epicatechin*	03940590
(-)-Epicatechin	68097
Eucalyptol (1,8-Cineole)**	95656
Eucalyptol (1,8-Cineole)*	00020590
Eucalyptol (1,8-Cineole)	29210

Compound	Cat. No.
Eugenol**	79891
Eugenol*	01050595
Eugenol	35995
<i>trans</i> -Ferulic acid**	52229
Kaempferol*	00550580
Kaempferol	96353
Linalool**	61706
Linalool	51782
<i>trans-p</i> -Methoxycinnamaldehyde	61384
Methyl eugenol	04607
α -Pinene	80599
α -Pinene*	00040590
Procyanidin B1	19542
Procyanidin B2	42157
Procyanidin C1	50878
Protocatechuic acid*	03930590
Protocatechuic acid	08992
Salicylic acid*	52341
<i>trans</i> -Sinapic acid	93878
(+)- α -Terpineol	83073
Vanillic acid*	68654
Citrus sp.	
Bergamottin	01338
Bergapten	69664
Bergaptol	62707
(-)- α -Bisabolol*	00320188
(-)- α -Bisabolol	95426
Biacangelicin	77686
<i>trans</i> -Caffeic acid**	51868
Caffeine**	56396
(-)-Carvone*	00290595
(+)-Carvone**	79245
(+)-Carvone	22070
(-)- <i>trans</i> -Caryophyllene	75541
Citropten	08941
<i>trans-p</i> -Coumaric acid	55823
<i>p</i> -Cymene**	49679
<i>p</i> -Cymene	30039
Didymin	38964
Dimethyl anthranilate	49919
Diosmetin	90985
Diosmin	61386

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Phytochemical Standards

Compound	Cat. No.
Eleutheroside B	90974
6',7'-Epoxybergamottin	69779
Eriodictyol	89061
trans, trans-Farnesol	92386
trans-Ferulic acid**	52229
Friedelin	92187
Geranyl Acetate	45896
8-Geranyloxypsoralen	40594
(±)-Hesperetin	51864
Hesperidin	50162
Isoimperatorin	68771
Isopimpinellin	61419
Isovitexin*	01120590
Isovitexin	67135
(R)-(+)-Limonene	62118
Limonin	64081
Linalool**	61706
Linalool*	00350190
Linalool	51782
Linalyl acetate	49599
Myrcene	64643
(±)-Naringenin	52186
Naringin	91842
Neohesperidin	40927
trans-Nerolidol	18143
Neryl acetate	46015
Nobiletin	92600
Nomilin	77518
Obacunone	74191
Octanal	52466
Poncirin	77536
Sabinene hydrate	96573
trans-Sinapic acid	93878
Sinensetin	89392
Synephrine	75256
Tangeretin	91004
Taxifolin**	03890585
Taxifolin	78666
γ-Terpinene	86476
Theophylline	PHR1023
Umbelliferone	54826
(+)-Valencene	06808
Xanthotoxin	56448

Compound	Cat. No.
Coleus sp.	
Crocin dialdehyde	18804
1,9-Dideoxyforskolin	92589
Forskolin	93049
Isoforskolin	94597
Commiphora sp.	
(E)-Guggulsterone	68797
(Z)-Guggulsterone	78251
Linalool**	61706
Linalool*	00350190
Linalool	51782
α-Pinene*	80599
α-Pinene	00040590
Sesamin	59867
Crataegus sp.	
Crataegus spp extract	05095001
trans-Caffeic acid**	51868
(+)-Catechin*	03910590
(+)-Catechin	43412
Chlorogenic Acid*	00500590
Epicatechin*	03940590
(-)-Epicatechin	68097
Hyperoside*	00180585
Kaempferol*	00550580
Kaempferol	96353
Luteolin*	03880590
Luteolin	72511
Luteolin 7-glucoside*	03600585
Luteolin 7-glucoside	49968
Oleanolic acid*	03920590
Oleanolic acid	42515
Procyanidin A2	28660
Procyanidin B1	19542
Procyanidin C1	50878
Rutin trihydrate*	00300590
Spiraeoside	91802
Ursolic acid*	03240595
Ursolic acid	89797
Vanillic acid 4-β-D-glucoside	14515
Vitexin*	00840595
Vitexin	49513
Vitexin 2-O-rhamnoside*	00660585
Vitexin 4''-O-glucoside	43907

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Compound	Cat. No.
Curcuma sp.	
(+)-Borneol	68878
Camphor (dl)*	02070595
Camphene	442505
<i>trans</i> -Cinnamic acid	97013
<i>trans-p</i> -Coumaric acid	55823
Curcumin*	00280590
Curcumin	08511
(-)-Curcumol	36236
Demethoxycurcumin	90593
Ethyl <i>trans</i> -4-methoxycinnamate	42479
Eucalyptol (1,8-Cineole)**	95656
Eucalyptol (1,8-Cineole)*	00020590
Eucalyptol (1,8-Cineole)	29210
Hexahydrocurcumin	69727
Protocatechuic acid*	03930590
Protocatechuic acid (3,4-Dihydroxybenzoic acid)	08992
Tetrahydrocurcumin	50202
(S)- α -Turmerone	42258
Vanillic acid**	68654
Cynara sp.	
<i>trans</i> -Caffeic acid**	51868
Chlorogenic Acid*	00500590
Cryptochlorogenic acid	90467
Cynarin	91801
1,5-Dicaffeoylquinic acid	16917
Luteolin*	03880590
Luteolin	72511
Luteolin 7-glucoside*	03600585
Luteolin 7-glucoside	49968
Neochlorogenic acid	91213
Rutin trihydrate*	00300590
Echinacea sp.	
Betaine**	30056
(+)-Borneol	68878
(-)-Bornyl acetate	45855
Caftaric acid	88656
(-)-Chicoric acid	06957
Chlorogenic acid*	00500590
Cynarin	91801
Echinacoside*	01710580
Echinacoside	07538
Kaempferol*	00550580

Compound	Cat. No.
Kaempferol	96353
Kuromanin chloride (Chrysanthemin)	44689
α -Pinene	80599
α -Pinene*	00040590
Quercetin dihydrate*	00200595
Rutin trihydrate*	00300590
Verbascoside*	00820580
Eclipta sp.	
Eclalbasaponin I	79736
Eclalbasaponin II	77084
Eleutherococcus sp.	
<i>trans</i> -Caffeic acid**	51868
Chlorogenic Acid*	00500590
Isofraxidin	91214
Eleutheroside E	08198
Oleanolic acid*	03920590
Oleanolic acid	42515
Eleutheroside B	90974
Epilobium sp.	
Hyperoside*	00180585
Kaempferol*	00550580
Kaempferol	96353
Myricetin	72576
Myricitrin	67268
Oenothetin B	03805
Oleanolic acid*	03920590
Oleanolic acid	42515
Quercetin 3-glucoside	16654
Quercetin dihydrate*	00200595
Quercitrin*	00740580
Ursolic acid*	03240595
Ursolic acid	89797
Equisetum sp.	
Apigenin*	01760595
Apigenin	42251
Dihydrokaempferol	92204
Kaempferol 3-glucoside	68437
Luteolin*	03880590
Luteolin	72511
(\pm)-Naringenin	52186
Quercetin 3-glucoside	16654
Taxifolin*	03890585
Taxifolin	78666

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Phytochemical Standards

Compound	Cat. No.
Eucalyptus sp.	
Camphor (dl)*	02070595
Camphene	442505
(+)-Catechin*	03910590
(+)-Catechin	43412
Ellagic acid	14668
Eucalyptol (1,8-Cineole)**	95656
Eucalyptol (1,8-Cineole)*	00020590
Eucalyptol (1,8-Cineole)	29210
Gallic acid*	91215
Hyperoside*	00180585
Kaempferol*	00550580
Kaempferol	96353
Myricetin	72576
α -Pinene	80599
α -Pinene*	00040590
Quercetin 3-glucoside	16654
Quercetin dihydrate*	00200595
Quercitrin*	00740580
Rutin trihydrate*	00300590
Sabinene hydrate	96573
Foeniculum sp.	
4-Allylanisole (Estragole)	05818
<i>trans</i> -Anethol	10368
<i>trans</i> -Anethol*	00130595
p-Anisaldehyde**	43621
p-Anisaldehyde	97063
Bergapten	69664
<i>trans</i> -Caffeic acid**	51868
Camphor (dl)*	02070595
Camphene	442505
Chlorogenic Acid*	00500590
<i>trans</i> -Cinnamic acid	97013
1,5-Dicaffeoylquinic acid	16917
(+)-Fenchone*	00380590
(+)-Fenchone	46208
<i>trans</i> -Ferulic acid	52229
Fumaric acid**	76635
Isorhamnetin	38907
Kaempferol*	00550580
Kaempferol	96353
(R)-(+)-Limonene	62118
Oleanolic acid*	03920590
Oleanolic acid	42515
(-)- α -Pinene	80599

Compound	Cat. No.
α -Pinene*	00040590
Protocatechuic acid*	03930590
Protocatechuic acid (3,4-Dihydroxybenzoic acid)	08992
Psoralen	73633
Quercetin 3-glucoside	16654
Quercetin dihydrate	00200595
Quercetin 3-glucuronide*	00310590
Quercetin 3-O-glucuronide	90733
Rutin trihydrate*	00300590
Scopoletin	38332
Umbelliferone	54826
Vanillic acid**	68654
Xanthotoxin	56448
Galium sp.	
Apigenin*	01760595
Apigenin	42251
<i>trans</i> -Caffeic acid**	51868
Chlorogenic Acid*	00500590
Coumarin**	72609
Coumarin*	01260595
Diosmetin	90985
Gallic acid**	91215
Hesperidin	50162
Kaempferol*	00550580
Kaempferol	96353
Luteolin*	03880590
Luteolin	72511
Myricetin	72576
Quercetin 3-glucoside	16654
Rubiadin	74553
Rutin trihydrate*	00300590
Salicylic acid**	52341
Scopoletin	38332
Garcinia sp.	
Amentoflavone	18571
Betulin	92648
(+)-Garcinia acid	44292
(-)-Calcium hydroxycitrate tribasic	75450
Kuromanin chloride (Chrysanthemine)	44689
Gentiana sp.	
Isoorientin	78109
Isovitexin*	01120590
Isovitexin	67135
Mangiferin	06279
Swertiamarin	90957

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Compound	Cat. No.
Ginkgo sp.	
<i>Ginkgo Biloba</i> extract	05485001
Amentoflavone	18571
Apigenin 7-glucoside*	00720585
Apigenin 7-glucoside	44692
Benzyl alcohol**	39971
Benzyl alcohol	08421
(-)-Bilobalide	79593
Dihydrokaempferol	92204
Epicatechin*	03940590
(-)-Epicatechin	68097
Epigallocatechin*	03960590
(-)-Epigallocatechin	08108
Ginkgolic acid C13:0	49962
Ginkgolic acid C15:1*	02580185
Ginkgolic acid C17:1*	01390590
Ginkgolid A*	00770590
Ginkgolid B	94970
Ginkgolide C	18309
Ginkgolid J	89556
Ginkgotoxin	89960
Isorhamnetin	38907
Kaempferol*	00550580
Kaempferol	96353
Kaempferol 3-glucoside	68437
Luteolin*	03880590
Luteolin	72511
N-Malonyl-DL-tryptophan	77556
Protocatechuic acid*	03930590
Protocatechuic acid	08992
Quercetin 3-glucoside	16654
Quercetin dihydrate*	00200595
Quercitrin*	00740580
Rutin trihydrate*	00300590
Shikimic acid	69686
Thymol*	00670590
Thymol	72477
Vanillic acid**	68654
Glycine sp.	
Daidzein	16587
Daidzin	42926
Fumaric acid**	76635
Genistein	92136
Genistin	73822
N-Malonyl-DL-tryptophan	77556

Compound	Cat. No.
β -Sitosterol	43623
β -Sitosterol β -D-glucoside	89851
Vitexin*	00840595
Vitexin	49513
Vitexin 2-O-rhamnoside*	00660585
Glycyrrhiza sp.	
Betulinic acid	91466
Docosyl caffeate	40971
Genistein	92136
Genistin	73822
Glycyrrhizic acid ammonium salt*	01250570
Glycyrrhizic acid ammonium salt	91443
Isoliquiritigenin	38986
Isorhamnetin	38907
Isovitexin*	01120590
Isovitexin	67135
Kaempferol*	00550580
Kaempferol	96353
Kaempferol 3-glucoside	68437
Lupeol	18692
(\pm)-Naringenin	52186
Quercetin dihydrate*	00200595
Rutin trihydrate*	00300590
Scopoletin	38332
Umbelliferone	54826
Vitexin*	00840595
Vitexin	49513
Gossypium sp.	
trans-Caffeic acid**	51868
(+)-Catechin*	03910590
(+)-Catechin	43412
Chlorogenic acid*	00500590
Kaempferide	69545
Kaempferol*	00550580
Kaempferol	96353
Kaempferol 3-glucoside	68437
Kuromanin chloride (Chrysanthemine)	44689
Quercitrin*	00740580
Rutin trihydrate*	00300590
β -Sitosterol	43623
β -Sitosterol β -D-glucoside	89851
Gymnema sp.	
Deacylgymnemic acid	40501
Gymnemangenin	52181

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Phytochemical Standards

Compound	Cat. No.
Hamamelis sp.	
<i>trans</i> -Caffeic acid**	51868
(+)-Catechin*	03910590
(+)-Catechin	43412
Epigallocatechin gallate*	03970590
(-)-Epigallocatechin gallate	93894
Gallic acid**	91215
(-)-Galocatechin	01388
Hamamelitannin	04646
Kaempferol*	00550580
Kaempferol	96353
Kaempferol 3-glucoside	68437
Myricetin	72576
Myricitrin	67268
Quercetin 3-glucoside	16654
Quercetin dihydrate*	00200595
Quercitrin*	00740580
Spiraeoside	91802
Harpagophytum sp.	
Harpagophytum procumbens extract	05125001
Harpagoside*	00420580
Verbascoside*	00820580
Hedera sp.	
<i>trans</i> -Caffeic acid**	51868
Chlorogenic acid*	00500590
<i>trans-p</i> -Coumaric acid	55823
<i>trans</i> -Ferulic acid	52229
Hederacoside C*	00930585
Hederacoside C	79737
α -Hederin*	01240585
α -Hederin	07512
Oleanolic acid*	03920590
Oleanolic acid	42515
Quercetin 3-glucoside	16654
Rutin trihydrate*	00300590
Apigenin 7-glucoside*	00720585
Humulus sp.	
Apigenin 7-glucoside	44692
<i>trans</i> -Caffeic acid**	51868
Chlorogenic Acid*	00500590
<i>trans-p</i> -Coumaric acid	55823
Epicatechin*	03940590
(-)-Epicatechin	68097
<i>trans</i> -Ferulic acid**	52229

Compound	Cat. No.
Gallic acid**	91215
Hulupinic acid*	01090595
α -Humulene	12448
Isoxanthohumol	55423
Kaempferol 3-glucoside	68437
Luteolin 7-glucoside*	03600585
Luteolin 7-glucoside	49968
2-Methyl-3-buten-2-ol	05392
Neochlorogenic acid	91213
6-Prenylnaringenin	75602
8-Prenylnaringenin	75119
Protocatechuic acid*	03930590
Protocatechuic acid (3,4-Dihydroxybenzoic acid)	08992
Quercetin 3-glucoside	16654
Rutin trihydrate*	00300590
Vanillic acid**	68654
Vitexin*	00840595
Vitexin	49513
Xanthohumol	01130595
Huperzia sp.	
(-)-Huperzine A	42643
Hypericum sp.	
Hypericum perforatum extract	05295001
Amentoflavone	18571
Apigenin 7-glucoside*	00720585
Apigenin 7-glucoside	44692
Avicularin	44006
I3,I18-Biapigenin	73962
(+)-Catechin*	03910590
(+)-Catechin	43412
Chlorogenic Acid*	00500590
Hypericin*	00190585
Hyperoside*	00180585
Kaempferol*	00550580
Kaempferol	96353
Luteolin*	03880590
Luteolin	72511
Luteolin 7-glucoside*	03600585
Luteolin 7-glucoside	49968
Mangiferin	06279
Myricetin	72576
Orientin*	03810585
Orientin	55736
Oxybenzone	59647

*Primary pharmaceutical reference standard HWI

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Compound	Cat. No.
Procyanidin B2	42157
Quercetin 3-glucoside	16654
Quercetin dihydrate	00200595
Quercitrin	00740580
Illicium sp.	
4-Allylanisole (Estragole)	05818
<i>trans</i> -Anethol	10368
<i>trans</i> -Anethol*	00130595
p-Anisaldehyde**	43621
p-Anisaldehyde	97063
Anisatin	80478
<i>trans</i> -Caffeic acid**	51868
(+)-Catechin*	03910590
(+)-Catechin	43412
1,4-Cineole	27393
<i>trans-p</i> -Coumaric acid	55823
Epicatechin*	03940590
(-)-Epicatechin	68097
Epigallocatechin*	03960590
(-)-Epigallocatechin	08108
(+)-Fenchone	00380590
(+)-Fenchone	46208
<i>trans</i> -Ferulic acid**	52229
Hyperoside*	00180585
Kaempferol 3-glucoside	68437
Linalool**	61706
Linalool*	00350190
Linalool	51782
Methyl eugenol	04607
Protocatechuic acid*	03930590
Protocatechuic acid	08992
Quercetin 3-glucoside	16654
Quercitrin*	00740580
Rutin trihydrate*	00300590
Shikimic acid	69686
(+)- α -Terpineol	83073
Vanillic acid**	68654
Justicia sp.	
Vanillic acid**	68654
Vasicine	92951
Lagerstroemia sp.	
Corosolic acid	89067
3-O-Methylellagic acid	93026

Compound	Cat. No.
Lavandula sp.	
Betulinic acid	91466
(+)-Borneol	68878
<i>trans</i> -Caffeic acid**	51868
Camphor (dl)*	02070595
Camphene	442505
Coumarin**	72609
Coumarin*	01260595
Eucalyptol (1,8-Cineole)**	95656
Eucalyptol (1,8-Cineole)*	00020590
Eucalyptol (1,8-Cineole)	29210
<i>trans</i> -Isoferulic acid	05407
Lavandulol	42583
(R)-(+)-Limonene	62118
Linalool**	61706
Linalool*	00350190
Linalool	51782
Linalyl acetate	49599
Lupeol	18692
Luteolin*	03880590
Luteolin	72511
3-Octanone	46214
Oleanolic acid*	03920590
Oleanolic acid	42515
(+)- β -Pinene	80607
Protocatechuic acid*	03930590
Protocatechuic acid	08992
Rosmarinic acid*	00390580
<i>trans</i> -Sinapic acid	93878
Terpinen 4-ol*	03900590
(-)-Terpinen-4-ol	49598
(+)- α -Terpineol	83073
Umbelliferone	54826
Ursolic acid*	03240595
Ursolic acid	89797
Vanillic acid**	68654
Vitexin	00840595
Vitexin	49513
Lycium sp.	
Kaempferol*	00550580
Kaempferol	96353
Quercetin dihydrate*	00200595
Rutin trihydrate*	00300590

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Phytochemical Standards

Compound	Cat. No.
Scopoletin	38332
Vanillic acid**	68654
Withanolide A	74776
Withanolide B	94284
Magnolia sp.	
(-)-Bornyl acetate	45855
Camphene	442505
Eucalyptol (1,8-Cineole)**	95656
Eucalyptol (1,8-Cineole)*	00020590
Eucalyptol (1,8-Cineole)	29210
Honokiol	42612
α -Pinene	80599
α -Pinene*	00040590
(+)- β -Pinene	80607
Sesamin	59867
(+)- α -Terpineol	83073
Malus sp.	
<i>trans</i> -Caffeic acid**	51868
(+)-Catechin*	03910590
(+)-Catechin	43412
<i>trans-p</i> -Coumaric acid	55823
Epicatechin*	03940590
(-)-Epicatechin	68097
(-)-Gallocatechin	01388
Hyperoside*	00180585
Phloretin	91897
Phloridzin dihydrate	79589
Procyanidin B1	19542
Procyanidin B2	42157
Procyanidin C1	50878
Quercetin 3-glucoside	16654
Quercetin dihydrate*	00200595
Quercitrin*	00740580
Rutin trihydrate*	00300590
Mangifera sp.	
Iriflophenone 3-C- β -D-glucopyranoside	91627
3 β -Taraxerol	75934
Matricaria sp.	
Apigenin*	01760595
Apigenin	42251
(-)- α -Bisabolol*	00320188
(-)- α -Bisabolol	95426
Chamazulen	91595
Luteolin*	03880590

Compound	Cat. No.
Luteolin	72511
Matricin	77347
Melilotus sp.	
(+)-Borneol	68878
(-)-Bornyl acetate	45855
<i>trans-p</i> -Coumaric acid	55823
Coumarin**	72609
Coumarin*	01260595
Protocatechuic acid*	03930590
Protocatechuic acid	08992
Salicylic acid*	52341
Scopoletin	38332
<i>trans</i> -Sinapic acid	93878
(+)- α -Terpineol	83073
Thujone Standard Mixture	04314
Umbelliferone	54826
Vanillic acid**	68654
Melissa sp.	
Apigenin 7-glucoside*	00720585
Apigenin 7-glucoside	44692
Betulinic acid	91466
<i>trans</i> -Caffeic acid**	51868
(-)- <i>trans</i> -Caryophyllene	75541
Chlorogenic Acid*	00500590
(\pm)-Citronellal	72638
<i>trans-p</i> -Coumaric acid	55823
<i>trans</i> -Ferulic acid**	52229
Geraniol	48798
Luteolin 7-glucoside*	03600585
Luteolin 7-glucoside	49968
Oleanolic acid*	03920590
Oleanolic acid	42515
Protocatechuic acid*	03930590
Protocatechuic acid	08992
Quercetin 3-glucoside	16654
Rosmarinic acid*	00390580
Salicylic acid**	52341
<i>trans</i> -Sinapic acid*	93878
Ursolic acid	03240595
Ursolic acid	89797
Vanillic acid**	68654
Mentha sp.	
Apigenin*	01760595
Apigenin	42251

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Compound	Cat. No.
Apigenin 7-glucoside*	00720585
Apigenin 7-glucoside	44692
<i>trans</i> -Caffeic acid*	51868
Camphor (dl)*	02070595
Camphene	442505
(+)-Carvone**	79245
(-)-Carvone*	00290595
(-)-Carvone	22060
(+)-Carvone	22070
<i>trans-p</i> -Coumaric acid	55823
Diosmetin	90985
Diosmin	61386
Eriocitrin	94113
Eriodictyol	89061
Eucalyptol (1,8-Cineole)**	95656
Eucalyptol (1,8-Cineole)*	00020590
Eucalyptol (1,8-Cineole)	29210
<i>trans</i> -Ferulic acid**	52229
Geraniol	48798
Hesperidin	50162
(1S,2R,5R)-(+)-Isomenthol	59802
(-)-Isopulegol*	04570595
(-)-Isopulegol	59770
Jasmon	59975
(R)-(+)-Limonene	62118
Luteolin*	03880590
Luteolin	72511
Luteolin 7-glucoside*	03600585
Luteolin 7-glucoside	49968
(+)-Menthofuran*	04580595
(+)-Menthofuran	63661
(-)-Menthol	00580590
(-)-Menthol	63660
(-)-Menthone	63677
(1R)-(-)-Menthyl acetate	45985
(+)-Pulegone*	04620590
(+)-Pulegone	82569
Rosmarinic acid*	00390580
(+)- α -Terpineol	83073
Ursolic acid*	03240595
Ursolic acid	89797
Momordica sp.	
Vicine	78260

Compound	Cat. No.
Murraya sp.	
Koenigicine	94500
Koenimbine	41096
Mahanimbine	77875
Myristica sp.	
(+)-Borneol	68878
Kaempferol*	00550580
Kaempferol	96353
(R)-(+)-Limonene	62118
Myristicin	09237
(-)- α -Pinene	80599
α -Pinene*	00040590
(+)- β -Pinene	80607
Sabinene hydrate	96573
Terpinen 4-ol*	03900590
(-)-Terpinen-4-ol	49598
γ -Terpinene	86476
(+)- α -Terpineol	83073
Myroxylon sp.	
Benzyl cinnamate	69139
Methyl <i>trans</i> -cinnamate	75032
Nerium sp.	
Betulin	92648
Betulinic acid	91466
Oleandrin	06069
Oleanolic acid*	03920590
Oleanolic acid	42515
Rutin trihydrate*	00300590
Ursolic acid*	03240595
Ursolic acid	89797
Ocimum sp.	
Apigenin*	01760595
Apigenin	42251
Cirsilineol	67403
Eucalyptol (1,8-Cineole)**	95656
Eucalyptol (1,8-Cineole)*	00020590
Eucalyptol (1,8-Cineole)	29210
Isoeugenol	34038
Methyl eugenol	04607
Orientin*	03810585
Orientin	55736
Ursolic acid*	03240595
Ursolic acid	89797

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Phytochemical Standards

Compound	Cat. No.
Olea sp.	
Apigenin*	01760595
Apigenin	42251
Apigenin 7-glucoside*	00720585
Apigenin 7-glucoside	44692
Betulinic acid	91466
<i>trans</i> -Caffeic acid*	51868
<i>trans</i> -Cinnamic acid	97013
<i>trans-p</i> -Coumaric acid	55823
Esculin hydrate	06212
<i>trans</i> -Ferulic acid**	52229
Kaempferol*	00550580
Kaempferol	96353
Luteolin 7-glucoside*	03600585
Luteolin 7-glucoside	49968
Maslinic acid	68594
Oleanolic acid*	03920590
Oleanolic acid	42515
Oleuropein	92167
Protocatechuic acid*	03930590
Protocatechuic acid (3,4-Dihydroxybenzoic acid)	08992
Quercetin dihydrate*	00200595
Quercitrin*	00740580
Rutin trihydrate*	00300590
Scopoletin	38332
Vanillic acid**	68654
Ononis sp.	
Apigenin*	01760595
Apigenin	42251
Apigenin 7-glucoside*	00720585
Apigenin 7-glucoside	44692
<i>trans</i> -Caffeic acid**	51868
<i>trans</i> -Cinnamic acid	97013
<i>trans-p</i> -Coumaric acid	55823
<i>trans</i> -Ferulic acid**	52229
Gallic acid**	91215
Genistein	92136
Hyperoside*	00180585
Kaempferol*	00550580
Kaempferol	96353
Luteolin*	03880590
Luteolin	72511
Luteolin 7-glucoside*	03600585
Luteolin 7-glucoside	49968

Compound	Cat. No.
Myricitrin	67268
Protocatechuic acid (3,4-Dihydroxybenzoic acid)	08992
Quercetin dihydrate*	00200595
Quercitrin*	00740580
Resorcinol**	53363
Rutin trihydrate*	00300590
<i>trans</i> -Sinapic acid	93878
Vanillin**	30304
Vitexin*	00840595
Vitexin	49513
Paeonia sp.	
Apigenin 7-glucoside*	00720585
Apigenin 7-glucoside	44692
Kaempferol*	00550580
Kaempferol	96353
Kaempferol 3-glucoside	68437
Paeoniflorin	75603
Quercetin dihydrate*	00200595
Panax sp.	
Panax ginseng extract*	05115001
Ginsenoside Rb1*	00170580
Ginsenoside Rb2	41868
Ginsenoside Rb3	42635
Ginsenoside Rd	01518
Ginsenoside Re*	03000590
Ginsenoside Re	77960
Ginsenoside Rf*	01580590
Ginsenoside Rg1*	00370580
Ginsenoside Rg2	08171
Ginsenoside Rg3	64139
Ginsenoside Rh1	56805
Notoginsenoside R1	77089
Protopanaxadiol	62685
Protopanaxatriol	42476
Pseudoginsenoside F11	67530
Vanillic acid**	68654
Papaver sp.	
Fumaric acid**	76635
Papaverine hydrochloride	PHR1182
Quercetin 3-glucoside	16654
Vanillic acid**	68654
Passiflora sp.	
Passiflora incarnata extract	05085001
Apigenin*	01760595

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Compound	Cat. No.
Apigenin	42251
Chrysin	95082
Geraniol	48798
Isoorientin	78109
Hyperoside*	00180585
Isoorientin*	03820585
Isovitexin	01120590
Isovitexin	67135
Oleanolic acid*	03920590
Oleanolic acid	42515
Orientin*	03810585
Orientin	55736
Schaftoside	42925
Scopoletin	38332
(+)- α -Terpineol	83073
Umbelliferone	54826
Vitexin*	00840595
Vitexin	49513
Pelargonium sp.	
Umckalin	50792
Peumus sp.	
Boldine	67592
Phyllanthus sp.	
Chebulagic acid	69455
Friedelin	92187
1-O-Galloyl- β -D-glucose	69288
Hypophyllanthin	75142
Phyllanthin	75110
Pimpinella sp.	
4-Allylanisole (Estragole)	05818
Anethol trans	10368
Anethol trans*	00130595
Angelicin	18118
p-Anisaldehyde**	43621
p-Anisaldehyde	97063
Apigenin*	01760595
Apigenin	42251
Apigenin 7-glucoside*	00720585
Apigenin 7-glucoside	44692
Bergapten	69664
<i>trans</i> -Caffeic acid**	51868
Chlorogenic Acid*	00500590
Cryptochlorogenic acid	90467
(+)-Fenchone*	00380590

Compound	Cat. No.
(+)-Fenchone	46208
Fumaric acid**	76635
Isoorientin	78109
Isoorientin*	03820585
Isopimpinellin	61419
Isovitexin*	01120590
Isovitexin	67135
Kaempferol*	00550580
Kaempferol	96353
Luteolin*	03880590
Luteolin	72511
Luteolin 7-glucoside*	03600585
Luteolin 7-glucoside	49968
Neochlorogenic acid	91213
Protocatechuic acid*	03930590
Protocatechuic acid (3,4-Dihydroxybenzoic acid)	08992
Quercetin 3-glucoside	16654
Quercetin dihydrate*	00200595
Quercetin 3-glucuronide*	00310590
Quercetin 3-O-glucuronide	90733
Rutin trihydrate*	00300590
Scopoletin	38332
(+)- α -Terpineol	83073
Umbelliferone	54826
Vanillic acid**	68654
Vanillic acid 4- β -D-glucoside	14515
Xanthotoxin	56448
Pinus sp.	
(+)-Borneol	68878
(-)-Bornyl acetate	45855
Camphene	442505
(-)- <i>trans</i> -Caryophyllene	75541
(+)-Catechin*	03910590
(+)-Catechin	43412
Chrysin	95082
<i>p</i> -Cymene**	49679
<i>p</i> -Cymene	30039
Dihydrokaempferol	92204
Guaiacol	PHR1136
Kaempferol*	00550580
Kaempferol	96353
(R)-(+)-Limonene	62118
Linalool**	61706
Linalool*	00350190

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Phytochemical Standards

Compound	Cat. No.
Linalool	51782
Myrcene	64643
Myricetin	72576
(-)- α -Pinene	80599
α -Pinene*	00040590
(+)- β -Pinene	80607
Pinoresinol	06709
Quercetin 3-glucoside	16654
Quercetin dihydrate*	00200595
Shikimic acid	69686
Taxifolin*	03890585
Taxifolin	78666
(+)- α -Terpineol	83073
Piper sp.	
4-Allylpyrocatechol	18078
<i>trans</i> -Caffeic acid**	51868
Camphor (dl)*	02070595
Camphene	442505
<i>trans</i> -Cinnamic acid	97013
Desmethoxyyangonin	51773
(S)-(+)-7,8-Dihydrokavain	41866
(+)-Dihydromethysticin	52007
Eucalyptol (1,8-Cineole)**	95656
Eucalyptol (1,8-Cineole)*	00020590
Eucalyptol (1,8-Cineole)	29210
<i>trans</i> -Ferulic acid**	52229
DL-Kavain	59780
Methyl eugenol	04607
R-(+)-Methysticin	80488
Naringenin 4',7-dimethylether	76716
Piperine	75047
Piperlyne	55805
Protocatechuic acid*	03930590
Protocatechuic acid (3,4-Dihydroxybenzoic acid)	08992
Salicylic acid**	52341
<i>trans</i> -Sinapic acid	93878
(+)- α -Terpineol	83073
Vanillic acid**	68654
Yangonin	75575
Plantago sp.	
Apigenin 7-glucoside*	00720585
Apigenin 7-glucoside	44692
Aucubine	55561
<i>trans</i> -Caffeic acid**	51868

Compound	Cat. No.
Chlorogenic Acid*	00500590
Neochlorogenic acid	91213
Verbascoside	00820580
Polygonum sp.	
Aloe-emodin*	93938
<i>trans</i> -Caffeic acid**	51868
Chlorogenic acid*	00500590
Chrysophanol	01542
<i>trans-p</i> -Coumaric acid	55823
Emodin	30269
Epicatechin*	03940590
(-)-Epicatechin	68097
Epicatechin 3-gallate (-)*	03950590
Gallic acid*	91215
Hyperoside*	00180585
Isovitexin*	01120590
Isovitexin	67135
Luteolin*	03880590
Luteolin	72511
Physcion	93893
Quercitrin*	00740580
<i>trans</i> -Resveratrol**	76511
Rhein	30873
Scopoletin	38332
Umbelliferone	54826
Vitexin*	00840595
Vitexin	49513
Potentilla sp.	
<i>trans</i> -Caffeic acid**	51868
(+)-Catechin*	03910590
(+)-Catechin	43412
Chlorogenic Acid*	00500590
<i>trans-p</i> -Coumaric acid	55823
Coumarin**	72609
Coumarin*	01260595
Cyanidin 3-O-rutinoside chloride (Keracyanin chloride)	36428
Ellagic acid	14668
Epigallocatechin*	03960590
(-)-Epigallocatechin	08108
<i>trans</i> -Ferulic acid**	52229
Gallic acid**	91215
(-)-Gallocatechin	01388
<i>trans</i> -Isoferulic acid	05407
Kaempferol*	00550580

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Compound	Cat. No.
Kaempferol	96353
Kuromanin chloride (Chrysanthemine)	44689
Myricetin	72576
Protocatechuic acid*	03930590
Protocatechuic acid (3,4-Dihydroxybenzoic acid)	08992
Quercetin dihydrate*	00200595
Quercetin 3-glucuronide*	00310590
Quercetin 3-O-glucuronide	90733
Quercitrin*	00740580
Scopoletin	38332
<i>trans</i> -Sinapic acid	93878
Umbelliferone	54826
Ursolic acid*	03240595
Ursolic acid	89797
Vanillic acid**	68654
Primula sp.	
Apigenin*	01760595
Apigenin	42251
<i>trans</i> -Caffeic acid**	51868
(+)-Catechin*	03910590
(+)-Catechin	43412
Epicatechin	03940590
(-)-Epicatechin	68097
Epigallocatechin*	03960590
(-)-Epigallocatechin	08108
Isorhamnetin	38907
Kaempferol*	00550580
Kaempferol	96353
Kaempferol 3-glucoside	68437
Myricetin	72576
Oenin chloride	04288
Primulaverin	30147
Primverin	90657
Quercetin 3-glucoside	16654
Quercetin dihydrate*	00200595
Rutin trihydrate*	00300590
Psoralea sp.	
Bakuchicin	75747
Bakuchiol	68612
Pueraria sp.	
Daidzein	16587
Daidzin	42926
Puerarin	96006
Tectoridin	89948
Tectorigenin	67359

Compound	Cat. No.
Punica sp.	
Asiatic acid	89773
Asiaticoside	43191
Betulinic acid	91466
Chlorogenic acid*	00500590
Corilagin	75251
<i>trans-p</i> -Coumaric acid	55823
Delphinidin 3-O-β-D-glucoside chloride	73705
Ellagic acid	14668
Gallic acid**	91215
Kuromanin chloride (Chrysanthemine)	44689
Neochlorogenic acid	91213
Protocatechuic acid*	03930590
Protocatechuic acid (3,4-Dihydroxybenzoic acid)	08992
Punicalagin	50793
Punicalin, mixture of anomers	67988
Ursolic acid*	03240595
Ursolic acid	89797
Quercus sp.	
Betulin	92648
(+)-Catechin*	03910590
(+)-Catechin	43412
Epicatechin*	03940590
(-)-Epicatechin	68097
Friedelin	92187
Gallic acid**	91215
(-)-Gallocatechin	01388
Hyperoside*	00180585
Lupeol	18692
Quercetin 3-glucoside	16654
Quercetin dihydrate*	00200595
Quercitrin*	00740580
Tiliroside	79257
Rhamnus sp.	
Aloe-emodin	93938
Aloin A	50292
Chelidonic acid	49526
Chrysophanol	01542
Emodin	30269
Frangulin A	61237
Frangulin B	68912
Isorhamnetin	38907
Kaempferide	69545
Kaempferol*	00550580
Kaempferol	96353

*Primary pharmaceutical reference standard HWI
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Phytochemical Standards

Compound	Cat. No.
Kaempferol 3-glucoside	68437
Physcion	93893
Quercetin 3-glucoside	16654
Quercetin dihydrate*	00200595
Rheum sp.	
Aloe-emodin	93938
(+)-Catechin*	03910590
(+)-Catechin	43412
Chrysophanol	01542
trans-p-Coumaric acid	55823
Cyanidin 3-O-rutinoside chloride (Keracyanin chloride)	36428
Emodin	30269
Epicatechin*	03940590
(-)-Epicatechin	68097
Gallic acid**	91215
(-)-Gallocatechin	01388
Kuromanin chloride (Chrysanthemin)	44689
Physcion	93893
Quercetin 3-glucoside	16654
Quercitrin*	00740580
Rhapontin	94168
Rhein	30873
Rutin trihydrate*	00300590
Sennoside A*	01870575
Sennoside B*	00530580
Rosmarinus sp.	
Betulin	92648
(+)-Borneol	68878
(-)-Bornyl acetate	45855
trans-Caffeic acid**	51868
Camphor (dl)*	02070595
Camphene	442505
Carnosic acid	91209
Carnosol (Pikrosalvin)	49702
trans-p-Coumaric acid	55823
Cryptotanshinone	80709
p-Cymene**	49679
p-Cymene	30039
Diosmetin	90985
Diosmin	61386
Eucalyptol (1,8-Cineole)**	95656
Eucalyptol (1,8-Cineole)*	00020590
Eucalyptol (1,8-Cineole)	29210
trans-Ferulic acid**	52229
(±)-Hesperetin	51864
Hesperidin	50162

Compound	Cat. No.
(R)-(+)-Limonene	62118
Luteolin*	03880590
Luteolin	72511
Luteolin 7-glucoside*	03600585
Luteolin 7-glucoside	49968
Myrcene	64643
Oleanolic acid*	03920590
Oleanolic acid	42515
(-)-α-Pinene	80599
α-Pinene*	00040590
Protocatechuic acid	03930590
Protocatechuic acid (3,4-Dihydroxybenzoic acid)	08992
Rosmarinic acid*	00390580
trans-Sinapic acid	93878
(+)-α-Terpineol	83073
Ursolic acid*	03240595
Ursolic acid	89797
Vanillic acid**	68654
Salix sp.	
(1S)-(-)-Verbenone	94882
Amentoflavone	18571
Apigenin*	01760595
Apigenin	42251
(+)-Catechin*	03910590
(+)-Catechin	43412
Chlorogenic Acid*	00500590
Dihydrokaempferol	92204
Eleutheroside B	90974
Epicatechin*	03940590
(-)-Epicatechin	68097
Eriodictyol	89061
Hyperoside*	00180585
Luteolin*	03880590
Luteolin	72511
Luteolin 7-glucoside*	03600585
Luteolin 7-glucoside	49968
(±)-Naringenin	52186
Neochlorogenic acid	91213
Picein	74192
Procyanidin B1	19542
Quercitrin*	00740580
D-(-)-Salicin	79588
Salidroside	43866
Taxifolin*	03890585
Taxifolin	78666

*Primary pharmaceutical reference standard HWI
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Compound	Cat. No.
Salvia sp.	
Apigenin*	01760595
Apigenin	42251
Apigenin 7-glucoside*	00720585
Apigenin 7-glucoside	44692
Betulin	92648
(+)-Borneol	68878
(-)-Bornyl acetate	45855
<i>trans</i> -Caffeic acid**	51868
Camphor (dl)*	02070595
Camphene	442505
Carnosic acid	91209
Carnosol (Pikrosalvin)	49702
Chlorogenic Acid*	00500590
Eucalyptol (1,8-Cineole)*	00020590
Cirsilineol	67403
<i>trans-p</i> -Coumaric acid	55823
Cryptochlorogenic acid	90467
Cryptotanshinone	80709
Diosmetin	90985
Eucalyptol (1,8-Cineole)	29210
<i>trans</i> -Ferulic acid**	52229
<i>trans</i> -Isoferulic acid	05407
(R)-(+)-Limonene	62118
Linalool	51782
Linalyl acetate	49599
Luteolin*	03880590
Luteolin	72511
Luteolin 7-glucoside*	03600585
Luteolin 7-glucoside	49968
Neochlorogenic acid	91213
Oleanolic acid*	03920590
Oleanolic acid	42515
(-)- α -Pinene	80599
α -Pinene*	00040590
(+)- β -Pinene	80607
Rosmarinic acid*	00390580
Salvianolic acid A	97599
Salvianolic acid B	49724
Sclareol	49944
<i>trans</i> -Sinapic acid	93878
Sodium 3-(3,4-dihydroxyphenyl)-DL-lactate	39363
Tanshinone I	80714
Tanshinone II A	51704
(+)- α -Terpineol	83073
Thujone Standard Mixture	04314

Compound	Cat. No.
Ursolic acid*	03240595
Ursolic acid	89797
Sambucus sp.	
Betulin	92648
<i>trans</i> -Caffeic acid**	51868
Chlorogenic Acid*	00500590
<i>trans-p</i> -Coumaric acid	55823
Cyanidin 3-O-rutinoside chloride (Keracyanin chloride)	36428
<i>trans</i> -Ferulic acid**	52229
Hyperoside*	00180585
Isoquercitrin*	00140585
Kaempferol*	00550580
Kaempferol	96353
Kaempferol 3-glucoside	68437
Kuromanin chloride (Chrysanthemine)	44689
Lupeol	18692
Oleanolic acid*	03920590
Oleanolic acid	42515
Quercetin 3-glucoside	16654
Quercetin dihydrate*	00200595
Quercitrin*	00740580
Rutin trihydrate*	00300590
Ursolic acid*	03240595
Ursolic acid	89797
Schisandra sp.	
Schizandrin A	90139
Scrophularia sp.	
Aucubine	55561
<i>trans</i> -Caffeic acid**	51868
<i>trans</i> -Cinnamic acid	97013
<i>trans-p</i> -Coumaric acid	55823
Diosmetin	90985
Diosmin	61386
<i>trans</i> -Ferulic acid**	52229
Harpagoside*	00420580
Hesperidin	50162
<i>trans</i> -Isoferulic acid	05407
Protocatechuic acid*	03930590
Protocatechuic acid (3,4-Dihydroxybenzoic acid)	08992
<i>trans</i> -Sinapic acid	93878
Vanillic acid**	68654
Senecio sp.	
Apigenin 7-glucoside*	00720585
Apigenin 7-glucoside	44692
(-)- α -Bisabolol*	00320188
(-)- α -Bisabolol	95426

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Phytochemical Standards

Compound	Cat. No.
Kaempferol 3-glucoside	68437
Quercetin 3-glucoside	16654
Quercetin dihydrate*	00200595
Quercitrin*	00740580
Rutin trihydrate*	00300590
Senecionine, dried down	37031
Senecionine	50351
Seneciophylline, dried down	37033
Seneciophylline	73913
Senkirkine, dried down	37032
Senna sp.	
Senna extract	05475001
Sennoside A*	01870575
Sennoside B*	00530580
Sennosid C	73235
Sennoside D	16383
Serenoa sp.	
Kaempferol 3-glucoside	68437
Rutin trihydrate*	00300590
β -Sitosterol	43623
β -Sitosterol β -D-glucoside	89851
Silybum sp.	
Silybum marianum extract	05135001
Apigenin*	01760595
Apigenin	42251
Apigenin 7-glucoside*	00720585
Apigenin 7-glucoside	44692
Dihydrokaempferol	92204
Eriodictyol	89061
Fumaric acid*	76635
Isofraxidin	91214
Isosilybin A	97326
Isosilybin B	95684
Kaempferide	69545
(\pm)-Naringenin	52186
Quercetin dihydrate*	00200595
Silybin	02000585
Silybin B	59527
Silychristin	51681
Silydianin	30494
Taxifolin*	03890585
Taxifolin	78666
Solanum sp.	
<i>trans</i> -Caffeic acid**	51868
<i>trans-p</i> -Coumaric acid	55823

Compound	Cat. No.
Degalactotigonin	92056
N-Malonyl-DL-tryptophan	77556
Scopoletin	38332
Umbelliferone	54826
Stevia sp.	
Dulcoside A	90378
Geraniol	48798
Isosteviol	92273
Luteolin 7-glucoside*	03600585
Luteolin 7-glucoside	49968
Quercetin 3-glucoside	16654
Quercitrin*	00740580
Rebaudioside A	38462
Rebaudioside B	49747
Rebaudioside C	30987
Rebaudioside D	19189
Rubusoside	62933
Steviol	19345
Steviolbioside	59754
Stevioside	50956
Syzygium sp.	
Acetyeugenol	04733
Bergenin	80479
Betulinic acid	91466
(+)-Borneol	68878
(-)-Bornyl acetate	45855
<i>trans</i> -Caffeic acid**	51868
Camphor (dl)*	02070595
Camphene	442505
(-)- <i>trans</i> -Caryophyllene	75541
<i>trans-p</i> -Coumaric acid	55823
Cryptochlorogenic acid	90467
Ellagic acid	14668
Eucalyptol (1,8-Cineole)**	95656
Eucalyptol (1,8-Cineole)*	00020590
Eucalyptol (1,8-Cineole)	29210
Eugenol**	79891
Eugenol*	01050595
Eugenol	35995
<i>trans</i> -Ferulic acid**	52229
Gallic acid**	91215
Geraniol	48798
Guaiacol	PHR1136
Hyperoside*	00180585
Isoeugenol	34038

*Primary pharmaceutical reference standard HWI

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Compound	Cat. No.
Kaempferol*	00550580
Kaempferol	96353
Kaempferol 3-glucoside	68437
Kuromanin chloride (Chrysanthemin)	44689
Methyl eugenol	04607
Myricetin	72576
Oleanolic acid*	03920590
Oleanolic acid	42515
(-)- α -Pinene	80599
α -Pinene*	00040590
(+)- β -Pinene	80607
Protocatechuic acid*	03930590
Protocatechuic acid (3,4-Dihydroxybenzoic acid)	08992
Quercetin 3-glucoside	16654
Quercetin dihydrate*	00200595
(+)- α -Terpineol	83073
Vanillic acid**	68654
Tanacetum sp.	
Apigenin*	01760595
Apigenin	42251
Apigenin 7-glucoside*	00720585
Apigenin 7-glucoside	44692
(-)-Bornyl acetate	45855
trans-Caffeic acid**	51868
Camphor (dl)*	02070595
Camphene	442505
Chamazulen	91595
Chlorogenic Acid*	00500590
Cirsilineol	67403
Diosmetin	90985
Eucalyptol (1,8-Cineole)**	95656
Eucalyptol (1,8-Cineole)*	00020590
Eucalyptol (1,8-Cineole)	29210
trans-Ferulic acid**	52229
Isofraxidin	91214
Isorhamnetin	38907
Linalyl acetate	49599
Luteolin*	03880590
Luteolin	72511
Luteolin 7-glucoside*	03600585
Luteolin 7-glucoside	49968
(\pm)-Naringenin	52186
Orientin*	03810585
Orientin	55736
(-)- α -Pinene	80599

Compound	Cat. No.
α -Pinene*	00040590
(+)- β -Pinene	80607
Protocatechuic acid*	03930590
Protocatechuic acid (3,4-Dihydroxybenzoic acid)	08992
Quercetin dihydrate*	00200595
Scopoletin	38332
Sesamin	59867
Thymol*	00670590
Thymol	72477
Terminalia sp.	
Arjunetin	90331
Arjunic acid	06244
(+)-Catechin*	03910590
(+)-Catechin	43412
Chebulagic acid	69455
Corilagin	75251
3,3'-Di-O-methyl ellagic acid 4'-O- β -D-xylopyranoside	90905
Ellagic acid	14668
Friedelin	92187
Gallic acid**	91215
Kaempferol*	00550580
Kaempferol	96353
Naringenin 4',7-dimethylether	76716
Oleanolic acid*	03920590
Oleanolic acid	42515
Punicalagin	50793
Quercetin dihydrate*	00200595
Shikimic acid	69686
trans-Sinapic acid	93878
1,3,6-Tri-O-galloyl- β -D-glucose	78864
Thymus sp.	
Apigenin*	01760595
Apigenin	42251
Apigenin 7-glucoside*	00720585
Apigenin 7-glucoside	44692
(+)-Borneol	68878
(-)-Bornyl acetate	45855
trans-Caffeic acid**	51868
Camphor (dl)*	02070595
Camphene	442505
Carvacrol	42632
Carvacrol	42632
Carvacrol methyl ether	43778
Cirsilineol	67403
p-Cymene**	49679

*Primary pharmaceutical reference standard HWI
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Phytochemical Standards

Compound	Cat. No.
<i>p</i> -Cymene	30039
Dihydrokaempferol	92204
Eriocitrin	94113
Eriodictyol	89061
Eucalyptol (1,8-Cineole)**	95656
Eucalyptol (1,8-Cineole)*	00020590
Eucalyptol (1,8-Cineole)	29210
<i>trans</i> -Ferulic acid**	52229
Geraniol	48798
Linalool**	61706
Linalool*	00350190
Linalool	51782
Linalyl acetate	49599
Luteolin*	03880590
Luteolin	72511
Luteolin 7-glucoside*	03600585
Luteolin 7-glucoside	49968
Myrcene	64643
(±)-Naringenin	52186
Oleanolic acid*	03920590
Oleanolic acid	42515
(-)- α -Pinene	80599
α -Pinene*	00040590
Protocatechuic acid*	03930590
Protocatechuic acid (3,4-Dihydroxybenzoic acid)	08992
Rosmarinic acid*	00390580
Sakuranetin	73422
Salicylic acid*	52341
<i>trans</i> -Sinapic acid	93878
Taxifolin*	03890585
Taxifolin	78666
Terpinen 4-ol*	03900590
(-)-Terpinen-4-ol	49598
γ -Terpinene	86476
(+)- α -Terpineol	83073
Thymol*	00670590
Thymol	72477
Ursolic acid*	03240595
Ursolic acid	89797
Vanillic acid**	68654
Tilia sp.	
<i>trans</i> -Caffeic acid**	51868
Chlorogenic Acid*	00500590
<i>trans-p</i> -Coumaric acid	55823
Ellagic acid	14668

Compound	Cat. No.
Esculin hydrate	06212
Fraxetin	18224
Fraxin	80533
Gallic acid**	91215
Hyperoside*	00180585
Isoquercitrin*	00140585
Kaempferol*	00550580
Kaempferol	96353
Kaempferol 3-glucoside	68437
Procyanidin B2	42157
Protocatechuic acid*	03930590
Protocatechuic acid (3,4-Dihydroxybenzoic acid)	08992
Quercetin 3-glucoside	16654
Quercetin dihydrate*	00200595
Quercitrin	00740580
Rutin trihydrate*	00300590
Tiliroside	79257
Tribulus sp.	
Tribulosin	51675
Triticum sp.	
N-Malonyl-DL-tryptophan	77556
β -Sitosterol	43623
β -Sitosterol β -D-glucoside	89851
Urtica sp.	
Oleanolic acid*	03920590
Oleanolic acid	42515
β -Sitosterol	43623
Vaccinum sp.	
Arbutin	66468
(+)-Catechin*	03910590
(+)-Catechin	43412
Chlorogenic Acid*	00500590
Cyanidin 3-O- α -L-arabinoside chloride	05098
Cyanidin 3-galactoside chloride (Idaein chloride)	91635
Cyanidin chloride	94099
Delphinidin chloride	14389
Delphinidin 3-O- β -D-galactoside chloride	04301
Delphinidin 3-O- β -D-glucoside chloride	73705
Epicatechin*	03940590
(-)-Epicatechin	68097
Hyperoside*	00180585
Kuromanin chloride (Chrysanthemine)	44689
Malvidin chloride	92607
Malvidin 3-galactoside chloride	79311
Myricetin	72576

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Compound	Cat. No.
Oenin chloride	04288
Oleanolic acid*	03920590
Oleanolic acid	42515
Peonidin 3-O-glucoside chloride	42008
Petunidin 3-O-β-D-glucoside chloride	30638
Procyanidin B1	19542
Procyanidin B2	42157
Procyanidin C1	50878
Protocatechuic acid*	03930590
Protocatechuic acid (3,4-Dihydroxybenzoic acid)	08992
Quercetin 3-glucoside	16654
Quercetin dihydrate*	00200595
Quercitrin*	00740580
Salicylic acid*	52341
Salidroside	43866
Syringic acid	63627
Ursolic acid*	03240595
Ursolic acid	89797
Valeriana sp.	
Valeriana officinalis extract	05105001
Acetoxyvalerenic acid	18543
(+)-Borneol	68878
(-)-Bornyl acetate	45855
<i>trans</i> -Caffeic acid**	51868
Camphor (dl)*	02070595
Camphene	442505
Chlorogenic acid*	00500590
Eucalyptol (1,8-Cineole)**	95656
Eucalyptol (1,8-Cineole)*	00020590
Eucalyptol (1,8-Cineole)	29210
Hesperidin	50162
Hydroxyvalerenic acid	55507
<i>trans</i> -Isoferulic acid	05407
(-)-α-Pinene	80599
α-Pinene*	00040590
(+)-β-Pinene	80607
(+)-α-Terpineol	83073
Valerenic acid*	02010595
Vanilla sp.	
Vanillin**	30304
Verbascum sp.	
Apigenin*	01760595
Apigenin	42251
Apigenin 7-glucoside*	00720585
Apigenin 7-glucoside	44692

Compound	Cat. No.
Aucubine	55561
<i>trans</i> -Caffeic acid**	51868
Chlorogenic acid*	00500590
<i>trans</i> -p-Coumaric acid	55823
Diosmin	61386
Eriodictyol	89061
<i>trans</i> -Ferulic acid**	52229
Harpagoside*	00420580
Hesperidin	50162
Kaempferol*	00550580
Kaempferol	96353
Luteolin*	03880590
Luteolin	72511
Luteolin 7-glucoside*	03600585
Luteolin 7-glucoside	49968
Protocatechuic acid*	03930590
Protocatechuic acid (3,4-Dihydroxybenzoic acid)	08992
Quercetin dihydrate*	00200595
Rutin trihydrate*	00300590
Vanillic acid*	68654
Verbascoside*	00820580
Viscum sp.	
Betulinic acid	91466
<i>trans</i> -Caffeic acid**	51868
Eleutheroside B	90974
Eleutheroside E	08198
<i>trans</i> -Ferulic acid**	52229
Isorhamnetin	38907
Oleanolic acid*	03920590
Oleanolic acid	42515
Protocatechuic acid*	03930590
Protocatechuic acid (3,4-Dihydroxybenzoic acid)	08992
Quercetin dihydrate*	00200595
Sakuranetin	73422
<i>trans</i> -Sinapic acid	93878
Ursolic acid*	03240595
Ursolic acid	89797
Vanillic acid**	68654
Vitex sp.	
Agnuside	12274
Aucubine	55561
(-)-Bornyl acetate	45855
Casticin	16382
Eucalyptol (1,8-Cineole)**	95656
Eucalyptol (1,8-Cineole)*	00020590

*Primary pharmaceutical reference standard HWI
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Phytochemical Standards

Compound	Cat. No.
Eucalyptol (1,8-Cineole)	29210
Isoorientin	78109
Isoorientin*	03820585
Isovitexin*	01120590
Isovitexin	67135
Luteolin 7-glucoside*	03600585
Luteolin 7-glucoside	49968
Negundoside	80724
Orientin*	03810585
Orientin	55736
(-)- α -Pinene	80599
α -Pinene*	00040590
(+)- β -Pinene	80607
Ursolic acid*	03240595
Ursolic acid	89797
Vitexin*	00840595
Vitexin	49513
Vitis sp.	
Caftaric acid	88656
(+)-Catechin*	03910590
(+)-Catechin	43412
Chlorogenic acid*	00500590
<i>trans-p</i> -Coumaric acid	55823
Delphinidin 3-O- β -D-glucoside chloride	73705
Epicatechin*	03940590
(-)-Epicatechin	68097
Geraniol	48798
Kuromanin chloride (Chrysanthemine)	44689
Malvidin chloride	92607
Oenin chloride	04288
Oleanolic acid*	03920590
Oleanolic acid	42515
Petunidin 3-O- β -D-glucoside chloride	30638
Procyanidin B1	19542
Procyanidin B2	42157
Procyanidin C1	50878
Quercetin 3-glucoside	16654
Quercetin 3-glucuronide*	00310590
Quercetin 3-O-glucuronide	90733
<i>trans</i> -Resveratrol**	76511

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Compound	Cat. No.
Withania sp.	
12-Deoxywithastramonolide	94187
β -Sitosterol β -D-glucoside	89851
Withaferin A	89910
Withanolide A	74776
Withanolide B	94284
Withanone	90896
Withanoside IV	94186
Withanoside V	66042
Zingiber sp.	
Asarylaldehyde	16219
(+)-Borneol	68878
Camphor (dl)*	02070595
Camphene	442505
(+)-Carvone**	79245
(-)-Carvone*	00290595
(-)-Carvone	22060
(+)-Carvone	22070
<i>trans-p</i> -Coumaric acid	55823
Eucalyptol (1,8-Cineole)**	95656
Eucalyptol (1,8-Cineole)*	00020590
Eucalyptol (1,8-Cineole)	29210
<i>trans</i> -Ferulic acid**	52229
[10]-Gingerol	42630
[6]-Gingerol	50866
[8]-Gingerol	01514
Kuromanin chloride (Chrysanthemine)	44689
Resorcinol*	53363
[6]-Shogaol	39303
<i>trans</i> -Sinapic acid	93878
Vanillic acid**	68654

Alphabetical Index

On the following pages, a complete list of phytochemical standards available through MilliporeSigma is shown in alphabetical order. The over 600 products include primary pharmaceutical standards from HWI (*) and TraceCERT® certified reference materials (**).

Description	Package	Cat. No.
Abscisic acid	25 mg	90769
Acacetin	10 mg	49975
Acetoxyvalerenic acid	10 mg	18543
3-O-Acetyl- β -boswellic acid	5 mg	49873
3-O-Acetyl-11-keto- β -boswellic acid	5 mg	74607
3-O-Acetyl- α -boswellic acid	5 mg	56208
3-O-Acetylboswellic acid, mixture of α and β	5 mg	96729
Acetyleneugenol	100 mg	04733
Aconitine	10 mg	44787
Agnuside	10 mg	12274
Allantoin	50 mg	93791
(+)-L-Alliin	10 mg	72805
4-Allylanisole (Estragole)	1 mL, 5 mL	05818
4-Allylpyrocatechol	10 mg	18078
Aloe-emodin	10 mg	93938
Aloenin A	10 mg	41757
Aloin A	10 mg	50292
Amentoflavone	10 mg	18571
(15:0)-Anacardic acid	10 mg	05506
Andrograpanin	5 mg	19443
Andrographolide	5 mg	90281
<i>trans</i> -Anethol*	100 mg	00130595
<i>trans</i> -Anethol	1 mL, 5 mL	10368
Angelicin	10 mg	18118
<i>p</i> -Anisaldehyde**	100 mg	43621
<i>p</i> -Anisaldehyde*	50 mg	05320590

Description	Package	Cat. No.
<i>p</i> -Anisaldehyde	1 mL, 5 mL	97063
Anisatin	10 mg	80478
Apigenin	10 mg	01760595
Apigenin	10 mg	42251
Apigenin-6,8-diglucoside (Vicenin 2)*	10 mg	03980585
Apigenin 7-glucoside*	10 mg	00720585
Apigenin 7-glucoside	5 mg, 25 mg	44692
Apigenin 7-O-glucuronide*	10 mg	04490590
Arbutin	50 mg	66468
Arbutin*	50 mg	00890590
Arjunetin	5 mg	90331
Arjunic acid	5 mg	06244
Artemisinin	10 mg	69532
β -Asarone*	25 mg	02890590
Asarylaldehyde	50 mg	16219
L-Ascorbic acid**	100 mg	57803
Asiatic acid	10 mg	89773
Asiaticoside*	10 mg	04560590
Asiaticoside	1 mg, 5 mg	43191
Aspalathin*	10 mg	03520585
Aspidinol	10 mg	55659
Aucubin*	25 mg	00090590
Aucubine	5 mg, 25 mg	55561
Avicularin	5 mg	44006
Bacopasaponin C	5 mg	76092
Bacopaside I	5 mg	56619

*Primary pharmaceutical reference standard HWI
 **TraceCERT®, certified reference material

Phytochemical Standards

Description	Package	Cat. No.
Bacopaside X	5 mg	42488
Bacopaside-II	5 mg	44698
Bacoside A, mixture of Bacoside A3, Bacopaside II, Bacopaside X and Bacopasaponin C	5 mg	76091
Bacoside A3	5 mg	53889
Bacosine	5 mg	69528
Bakuchicin	10 mg	75747
Bakuchiol	10 mg	68612
Benzyl alcohol**	100 mg	39971
Benzyl alcohol	5 mL, 25 mL	08421
Benzyl benzoate**	1 mL	55177
Benzyl benzoate	1 mL	68183
Benzyl cinnamate	100 mg	69139
Bergamottin	5 mg	01338
Bergapten	25 mg	69664
Bergaptol	10 mg	62707
Bergenin	10 mg	80479
Betaine**	50 mg	30056
Betulin	50 mg	92648
Betulin 3, 28-diacetate	25 mg	59919
Betulinic acid	10 mg	91466
Biacangelicin	10 mg	77686
I3,I18-Biapigenin	10 mg	73962
Bilobalide*	10 mg	00760595
(-)-Bilobalide	10 mg	79593
Biotin**	50 mg	91827
(-)- α -Bisabolol*	100 mg	00320188
(-)- α -Bisabolol	1 mL	95426
Bisabolol oxide A*	25 mg	00630590
Bisabolol oxide A	10 mg	59761
Boeravinone B	10 mg	96844
Boldine	100 mg	67592
(+)-Borneol	10 mg	68878
(-)-Bornyl acetate*	50 mg	00400585
(-)-Bornyl acetate	1 mL, 5 mL	45855
α -Boswellic acid	10 mg	06813
β -Boswellic acid	5 mg	80342
Boswellic acid, mixture of α and β	5 mg	63850
Butein	10 mg	72795
<i>trans</i> -Caffeic acid**	50 mg	51868
Caffeine**	100 mg	56396
Caftaric acid	10 mg	88656
Camellia sinensis extract	150 mg	05495001

Description	Package	Cat. No.
Camphene*	100 mg	01410590
Camphor (dl)*	100 mg	02070595
Camphene	1000 mg	442505
Capsaicin	10 mg, 50 mg	12084
Capsaicin**	50 mg	75049
Cardanol	50 mg	04016
(+)-3- δ -Carene*	100 mg	00410590
Carnosic acid*	10 mg	05330590
Carnosic acid	5 mg	91209
Carnosol (Pikrosalvin)	10 mg	49702
Carvacrol	50 mg	42632
Carvacrol*	50 mg	04270590
Carvacrol methyl ether	50 mg	43778
(-)-Carveol, mixture of isomers	50 mg	61370
(-)-Carvone*	100 mg	00290595
(+)-Carvone**	100 mg	79245
(-)-Carvone	1 mL, 5 mL	22060
(+)-Carvone	1 mL	22070
(-)- <i>trans</i> -Caryophyllene	1 mL	75541
Castalagin	10 mg	61221
Casticin	10 mg	16382
Casticin*	10 mg	01940590
(+)-Catechin*	10 mg	03910590
(+)-Catechin	10 mg	43412
Catechin 5-O-gallate	10 mg	89106
Chamazulen	20 mg	91595
Chebulagic acid	10 mg	69455
Chebulinic acid	10 mg	40820
Chelidonic acid	100 mg	49526
(-)-Chicoric acid	10 mg	06957
Chlorogenic acid*	25 mg	00500590
Chrysanthemine (Kuromanin chloride)	5 mg	44689
Chrysin	50 mg	95082
Chrysophanol	25 mg	01542
2CR-Cinchonin	50 mg	30729
(+)-Cinchonine	50 mg	19431
1,4-Cineole	1 mL, 5 mL	27393
1,8-Cineole (Eucalyptol)**	100 mg	95656
1,8-Cineole (Eucalyptol)*	100 mg	00020590
1,8-Cineole (Eucalyptol)	1 mL	29210
<i>trans</i> -Cinnamaldehyde	50 mg	06536
<i>trans</i> -Cinnamic acid	50 mg	97013
Cinnamyl acetate	1 mL	42759

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Description	Package	Cat. No.
Cinnamyl alcohol	50 mg	93066
Cirsilineol	5 mg	67403
Citral	1 mL	43318
Citric acid**	100 mg	94676
(±)-Citronellal	1 mL	72638
Citropten	100 mg	08941
Coptisin chloride	10 mg	39273
Corilagin	10 mg	75251
Corosolic acid	10 mg	89067
m-Coumaric acid	10 mg	92649
p-Coumaric acid*	50 mg	03200595
trans-p-Coumaric acid	50 mg	55823
Coumarin*	50 mg	01260595
Coumarin**	100 mg	72609
Crataegus spp extract	150 mg	05095001
Crocetin dialdehyde	10 mg	18804
Cryptochlorogenic acid	5 mg	90467
Cryptotanshinone	10 mg	80709
Curcumin*	10 mg	00280590
Curcumin	10 mg	08511
(-)-Curcumol	10 mg	36236
Cyanidin 3-O-α-L-arabinoside chloride	10 mg	05098
Cyanidin chloride	10 mg	94099
Cyanidin 3-galactoside chloride (Idaein chloride)	10 mg	91635
Cyanidin 3-O-rutinoside chloride (Keracyanin chloride)	1 mg, 5 mg	36428
Cyanidin-3-sambubiosidchloride	5 mg	43046
Cyanidin-3-sophorosidchloride	5 mg	42739
Cycloolivil	10 mg	56523
p-Cymene	5 mL	30039
p-Cymene**	100 mg	49679
Cynarin	5 mg	91801
Daidzein*	50 mg	05340590
Daidzein	10 mg	16587
Daidzin*	10 mg	05370590
Daidzin	10 mg	42926
Deacylgymnemic acid	5 mg	40501
Degalactotigonin	10 mg	92056
Dehydrocostus lactone	10 mg	42575
2',3'-Dehydrosalannol	10 mg	80098
Delphinidin chloride	10 mg	14389
Delphinidin 3-O-β-D-galactoside chloride	10 mg	04301

Description	Package	Cat. No.
Delphinidin 3-O-β-D-glucoside chloride	10 mg	73705
Delphinidin-3-sambubioside chloride	5 mg	42883
Demethoxycurcumin	10 mg	90593
14-Deoxy-11,12-didehydroandrographolide	5 mg	55549
12-Deoxywithastramonolide	10 mg	94187
Desmethoxyyangonin	5 mg	51773
1,5-Dicaffeoylquinic acid	5 mg	16917
1,9-Dideoxyforskolin	10 mg	92589
Didymin	10 mg	38964
Digoxin**	50 mg	04599
Dihydrocapsaicin	5 mg	03813
(+)-Dihydrocarvone, mixture of isomers	50 mg	09164
Dihydrokaempferol	5 mg	92204
(S)-(+)-7,8-Dihydrokavain	5 mg	41866
(+)-Dihydromethysticin	5 mg	52007
Dihydromyricetin	10 mg	42866
(-)-Dihydroquinine	50 mg	11532
Dimethyl anthranilate	1 mL	49919
Dimethylpropiothetin hydrochloride	100 mg	80828
3,3'-Di-O-methylellagic acid 4'-xylopyranoside	10 mg	90905
Diosmetin	10 mg	90985
Diosmin	50 mg	61386
Docosyl caffeate	10 mg	40971
Dulcoside A	10 mg	90378
Echinacoside*	10 mg	01710580
Echinacoside	10 mg	07538
Eclalbasaponin I	10 mg	79736
Eclalbasaponin II	10 mg	77084
(-)-β-Elementene	25 mg	63965
Elemolic acid, mixture of α and β	5 mg	73527
β-Elementonic acid	5 mg	00708
Eleutheroside B (Syringin)	10 mg	90974
Ellagic acid*	50 mg	05350590
Ellagic acid	50 mg	14668
Emodin	10 mg	30269
Epicatechin*	10 mg	03940590
(-)-Epicatechin	10 mg	68097
(-)-Epicatechin 3-gallate*	10 mg	03950590
Epicinchonine	50 mg	38105
Epigallocatechin*	10 mg	03960590

*Primary pharmaceutical reference standard HWI

**TraceCERT®, certified reference material

Phytochemical Standards

Description	Package	Cat. No.
(-)-Epigallocatechin	1 mg	08108
Epigallocatechin gallate*	10 mg	03970590
(-)-Epigallocatechin gallate	10 mg	93894
Epiquinidine	50 mg	00998
Epiquinine	50 mg	89457
6',7'-Epoxybergamottin	10 mg	69779
Eriocitrin	5 mg	94113
Eriocitrin*	10 mg	02660590
Eriodictyol	10 mg	89061
Esculin hydrate	100 mg	06212
Estragole (4-Allylanisole)	1 mL, 5 mL	05818
Ethyl trans-4-methoxycinnamate	10 mg	42479
Eucalyptol (1,8-Cineole)**	100 mg	95656
Eucalyptol (1,8-Cineole)*	100 mg	00020590
Eucalyptol (1,8-Cineole)	1 mL	29210
Eugenol**	100 mg	79891
Eugenol*	100 mg	01050595
Eugenol	250 mg	35995
Eupalitin	10 mg	66324
Eupalitin 3-O β -D-galactopyranoside	10 mg	89165
Eupatorin	10 mg	52559
<i>trans, trans</i> -Farnesol	100 mg	92386
(+)-Fenchone*	100 mg	00380590
(+)-Fenchone	1 mL, 5 mL	46208
<i>trans</i> -Ferulic acid**	50 mg	52229
Formononetin	50 mg	94334
Forskolin	10 mg	93049
Frangulin A	10 mg	61237
Frangulin B	10 mg	68912
Fraxetin	50 mg	18224
Fraxin	10 mg	80533
Friedelin	10 mg	92187
Fumaric acid**	100 mg	76635
Gallic acid**	100 mg	91215
(-)-Galocatechin	10 mg	01388
(-)-Galocatechin gallate	10 mg	80352
1-O-Galloyl- β -D-glucose	10 mg	69288
(+)-Garcinia acid	10 mg	44292
Genistein*	50 mg	05360590
Genistein	10 mg	92136
Genistin*	25 mg	05380590
Genistin	10 mg	73822
Genkwanin	10 mg	42734
Geraniol	1 mL, 5 mL	48798

Description	Package	Cat. No.
Geranyl Acetate	1 mL	45896
Geranyl acetate*	100 mg	01290190
8-Geranyloxyorsoralen	10 mg	40594
Germacron	10 mg	42924
[10]-Gingerol	10 mg	42630
[6]-Gingerol	10 mg	50866
[8]-Gingerol	10 mg	01514
<i>Ginkgo Biloba</i> extract	150 mg	05485001
Ginkgolic acid C13:0	10 mg	49962
Ginkgolic acid C15:1*	10 mg	02580185
Ginkgolic acid C17:1*	10 mg	01390590
Ginkgolid A*	25 mg	00770590
Ginkgolid B	10 mg	94970
Ginkgolide C	10 mg	18309
Ginkgolid J	5 mg	89556
Ginkgotoxin	10 mg	89960
Ginkgolide C*	25 mg	01490590
Ginsenoside R0	10 mg	94381
Ginsenoside Rb1*	10 mg	00170580
Ginsenoside Rb2	10 mg	41868
Ginsenoside Rb3	10 mg	42635
Ginsenoside Rc	5 mg	44987
Ginsenoside Rd	10 mg	01518
Ginsenoside Re*	10 mg	03000590
Ginsenoside Re*	10 mg	77960
Ginsenoside Rf*	10 mg	01580590
Ginsenoside Rg1*	10 mg	00370580
Ginsenoside Rg2	10 mg	08171
Ginsenoside Rg3	10 mg	64139
Ginsenoside Rg6	5 mg	43019
Ginsenoside Rh1	10 mg	56805
Ginsenoside Rh3	5 mg	43084
Ginsenoside Rh4	5 mg	42776
Glutaric acid**	100 mg	89147
Glycolic acid**	100 mg	94815
Glycitein	10 mg	43534
Glycyrrhizic acid ammonium salt*	50 mg	01250570
Glycyrrhizic acid ammonium salt	10 mg	91443
Guaiacol	1.5g	PHR1136
Guajaverin	5 mg	94821
(E)-Guggulsterone	10 mg	68797
(Z)-Guggulsterone	10 mg	78251
(-)- α -Gurjunene	5 mg	93449
Gymnemangenin	5 mg	52181

*Primary pharmaceutical reference standard HWI

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Description	Package	Cat. No.
Hamamelitannin	5 mg	04646
Harpagophytum procumbens extract	150 mg	05125001
Harpagoside*	25 mg	00420580
Hederacoside C*	10 mg	00930585
Hederacoside C	10 mg	79737
α -Hederin*	10 mg	01240585
α -Hederin	10 mg	07512
Herniarin*	10 mg	02250595
(\pm)-Hesperetin	50 mg	51864
Hesperidin*	25 mg	04650590
Hesperidin	10 mg	50162
Hexahydrocurcumin	10 mg	69727
Isoorientin	5 mg	78109
Honokiol	25 mg	42612
Hordenine	50 mg	61207
Hulupinic acid*	10 mg	01090595
α -Humulene	250 mg	12448
(-)-Huperzine A	25 mg	42643
Hydroquinone	100 mg	74347
(-)-Calcium hydroxycitrate tribasic	10 mg	75450
Hydroxyvaleric acid	5 mg	55507
Hypericin*	10 mg	00190585
Hypericum perforatum extract	150 mg	05295001
Hyperoside*	25 mg	00180585
Hyperforin dicyclohexylammonium salt	5 mg	42891
Hypophyllanthin	10 mg	75142
Icariin	25 mg	56601
Idaein chloride (Cyanidin 3-galactoside chloride)	10 mg	91635
Imperatorin (Marmelosin)	10 mg	55193
Iriflophenone 3-C- β -D- glucopyranoside	10 mg	91627
(+)-Isocorydin	10 mg	42899
Isoeugenol	5 mL	34038
<i>trans</i> -Isoferulic acid	10 mg	05407
Isoforskolin	10 mg	94597
Isofraxidin	5 mg	91214
Isoimperatorin	10 mg	68771
Isoliquiritigenin	50 mg	38986
(1S,2R,5R)-(+)-Isomenthol*	25 mg	04280590
(1S,2R,5R)-(+)-Isomenthol	25 mg	59802
Isoorientin*	10 mg	03820585
Isopimpinellin	10 mg	61419
(-)-Isopulegol*	50 mg	04570595
(-)-Isopulegol	5 mL	59770

Description	Package	Cat. No.
Isoquercitrin*	25 mg	00140585
Isorhamnetin	10 mg	38907
Isorhamnetin*	10 mg	04290585
Isorhamnetin-3-O- β -D glucopyranosyl-(1-2)- β -D glucopyranosyl-(1-6)- β -D glucopyranoside*	10 mg	00960590
Isosilybin A	5 mg	97326
Isosilybin B	5 mg	95684
Isosteviol	10 mg	92273
Isovitexin*	10 mg	01120590
Isovitexin	5 mg	67135
Isoxanthohumol	5 mg	55423
Jasmon	1 mL	59975
Kaempferide	10 mg	69545
Kaempferol*	10 mg	00550580
Kaempferol	10 mg	96353
Kaempferol 3-glucoside	5 mg	68437
Kaempferol-3-glucoside*	10 mg	04500585
DL-Kavain	500 mg	59780
Keracyanin chloride (Cyanidin 3-O-rutinoside chloride)	1 mg, 5 mg	36428
11-Keto- b-boswellic acid	5 mg	78535
Khellin	100 mg	00899
Koenigicine	10 mg	94500
Koenimbine	10 mg	41096
Kuromanin chloride (Chrysanthemine)	5 mg	44689
Larixylacetat*	50 mg	02730595
Lavandulol	50 mg	42583
(R)-(+)-Limonene*	100 mg	00590590
(R)-(+)-Limonene	1 mL, 5 mL	62118
Limonin	10 mg	64081
Linalool**	50 mg	61706
Linalool*	100 mg	00350190
Linalool	1 mL	51782
Linalyl acetate	100 mg	49599
Eleutheroside E	10 mg	08198
Lupeol	10 mg	18692
Lutein	1 mg, 5 mg	07168
Luteolin*	25 mg	03880590
Luteolin	10 mg	72511
Luteolin 7-glucoside*	10 mg	03600585
Luteolin 7-glucoside	10 mg	49968
Luteolin-7-O- β -D-glucuronide*	10 mg	04480585
Magnesium L-lactate hydrate**	100 mg	40394

*Primary pharmaceutical reference standard HWI
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Phytochemical Standards

Description	Package	Cat. No.
Mahanimbine	10 mg	77875
L(-)-Malic acid**	100 mg	09172
Malonic acid**	100 mg	68714
N-Malonyl-DL-tryptophan	10 mg	77556
Malvidin chloride	10 mg	92607
Malvidin 3-galactoside chloride	1 mg	79311
Mangiferin	10 mg	06279
Marmelosin (Imperatorin)	10 mg	55193
Maslinic acid	5 mg	68594
Matairesinol	5 mg	04157
Matricin	5 mg	77347
Menthofuran*	50 mg	04580595
(+)-Menthofuran*	50 mg	04580595
(+)-Menthofuran	1 mL, 5 mL	63661
(-)-Menthol*	100 mg	00580590
(-)-Menthol	1g	63660
(-)-Menthone	5 mL	63677
(-)-Menthone*	100 mg	04660585
Menthylacetat*	100 mg	04590595
(1R)-(-)-Menthyl acetate	1 mL, 5 mL	45985
trans-p-Methoxycinnamaldehyde	50 mg	61384
Methyl trans-cinnamate	50 mg	75032
2-Methyl-3-buten-2-ol	1 mL	05392
3-O-Methylellagic acid	10 mg	93026
Methyl eugenol	50 mg	04607
Methylpiperogonanone B	5 mg	92542
7-O-Methylwogonin	5 mg	41442
R-(+)-Methysticin	5 mg	80488
Myrcene*	50 mg	04600585
Myrcene	100 mg	64643
Myricetin*	10 mg	05390590
Myricetin	10 mg	72576
Myricitrin*	10 mg	02180585
Myricitrin	10 mg	67268
Myristicin	10 mg, 50 mg	09237
(±)-Naringenin	50 mg	52186
Naringenin 4',7-dimethylether	5 mg	76716
Naringin	500 mg	91842
Negundoside	10 mg	80724
Neoandrographolide	5 mg	49879
Neochlorogenic acid	5 mg	91213
Neohesperidin	10 mg	40927
Neohesperidin dihydrochalcone	100 mg	75041
trans-Nerolidol*	50 mg	04610590

Description	Package	Cat. No.
trans-Nerolidol	100 mg	18143
Neryl acetate	1 mL	46015
Nobiletin	10 mg	92600
Nomilin	10 mg	77518
Notoginsenoside R1	10 mg	77089
N-Vanillylnonamide	50 mg, 100 mg	15971
Obacunone	10 mg	74191
Octanal	1 mL, 5 mL	52466
3-Octanone	5 mL	46214
Oenin chloride	10 mg	04288
Oenothien B	10 mg	03805
Oleandrin	5 mg	06069
Oleanolic acid*	10 mg	03920590
Oleanolic acid	10 mg	42515
Oleuropein*	10 mg	05400590
Oleuropein	10 mg	92167
Orientin*	10 mg	03810585
Orientin	5 mg	55736
Osthole*	10 mg	02150595
Oxybenzone	50 mg	59647
Oxypeucedanin	5 mg	42904
Paeoniflorin	10 mg	75603
Panax ginseng extract	150 mg	05115001
Papaverine hydrochloride	500 mg	PHR1182
Passiflora incarnata extract	150 mg	05085001
5-Pentadecylresorcinol	10 mg	91822
Peonidin 3-O-glucoside chloride	1 mg	42008
Petunidin 3-O-β-D-glucoside chloride	10 mg	30638
Phloretin	10 mg	91897
Phloridzin dihydrate	50 mg	79589
p-Hydroxybenzoic acid	1g	PHR1048
Phyllanthin	10 mg	75110
Physcion	10 mg	93893
Picein	10 mg	74192
Pikrosalvin (Carnosol)	10 mg	49702
(-)-β-Pinene*	100 mg	00080590
α-Pinene*	100 mg	00040590
(-)-α-Pinene	1 mL, 5 mL	80599
(+)-β-Pinene	1 mL, 5 mL	80607
Pinoresinol	10 mg	06709
Piperine	50 mg	75047
Piperyline	10 mg	55805
Poncirin	10 mg	77536
6-Prenylnaringenin	5 mg	75602

*Primary pharmaceutical reference standard HWI

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Description	Package	Cat. No.
8-Prenylnaringenin	5 mg	75119
Primulaverin	5 mg	30147
Primverin	5 mg	90657
Procyanidin A2	10 mg	28660
Procyanidin B1	1 mg	19542
Procyanidin B2	1 mg	42157
Procyanidin C1	5 mg	50878
Progoitrin potassium salt	10 mg	76197
Protocatechuic acid*	50 mg	03930590
Protocatechuic acid	50 mg	08992
Protopanaxadiol	10 mg	62685
Protopanaxatriol	10 mg	42476
Protopin	10 mg	07267
Pseudoginsenoside F11	10 mg	67530
Pseudohypericin	5 mg	51593
Psoralen	10 mg	73633
Puerarin	10 mg	96006
(+)-Pulegone*	100 mg	04620590
(+)-Pulegone	5 mL	82569
Punicalagin	10 mg	50793
Punicalin, mixture of anomers	10 mg	67988
Pyrogallol	50 mg	06931
Quercetin dihydrate*	50 mg	00200595
Quercetin 3-glucoside	10 mg	16654
Quercetin 3-glucuronide*	25 mg	00310590
Quercetin 3-O-glucuronide	5 mg	90733
Quercetin 3-O-rutinoside-7-O-glucoside	10 mg	55836
Quercitrin*	25 mg	00740580
<i>trans</i> -Quercus lactone	100 mg	72777
Quinine**	50 mg	69311
Rebaudioside A	10 mg	38462
Rebaudioside B	10 mg	49747
Rebaudioside C	10 mg	30987
Rebaudioside D	10 mg	19189
Reserpine**	50 mg	06859
Resorcinol**	100 mg	53363
<i>trans</i> -Resveratrol**	100 mg	76511
Rhapontin	50 mg	94168
Rhein	10 mg	30873
Rosmarinic acid*	25 mg	00390580
Rubiadin	10 mg	74553
Rubusoside	10 mg	62933
Rutin trihydrate*	50 mg	00300590

Description	Package	Cat. No.
Sabinen hydrate*	50 mg	04630590
Sabinene hydrate	500 mg	96573
Safrole**	100 mg	08010
Sakuranetin	10 mg	73422
D-(-)-Salicin	100 mg	79588
Salicylic acid**	50 mg	52341
Salidroside*	10 mg	05410590
Salidroside	25 mg	43866
Salvianolic acid A	10 mg	97599
Salvianolic acid B	10 mg	49724
(-)- α -Santonin	10 mg	53653
Schaftoside	5 mg	42925
Schizandrin A	50 mg	90139
Sclareol	100 mg	49944
Scopoletin	10 mg	38332
Scutellarin	10 mg	73577
Senecionine, dried down solution	0.05 mg	37031
Senecionine	5 mg	50351
Seneciophylline, dried down solution	0.05 mg	37033
Seneciophylline	5 mg	73913
Senkirkine, dried down solution	0.05 mg	37032
Senna extract	150 mg	05475001
Sennoside A*	25 mg	01870575
Sennoside A	5 mg, 25 mg	68909
Sennoside B*	25 mg	00530580
Sennoside B	25 mg	75412
Sennosid C	10 mg	73235
Sennoside D	10 mg	16383
Serratol	5 mg	78689
Sesamin	10 mg	59867
Shatavarin IV	10 mg	30151
Shikimic acid	50 mg	69686
[6]-Shogaol	10 mg	39303
Silybin*	25 mg	02000585
Silybin B	5 mg	59527
Silybum marianum extract	150 mg	05135001
Silychristin	10 mg	51681
Silydianin	10 mg	30494
<i>trans</i> -Sinapic acid	50 mg	93878
Sinensetin	10 mg	89392
(-)-Sinigrin hydrate	10 mg	00290
β -Sitosterol*	10 mg	05410590
β -Sitosterol	10 mg	43623

*Primary pharmaceutical reference standard HWI
**TraceCERT®, certified reference material

Phytochemical Standards

Description	Package	Cat. No.
β-Sitosterol β-D-glucoside	10 mg	89851
Sodium 3-(3,4-dihydroxyphenyl)-DL-lactate	5 mg, 25 mg	39363
Sodium propionate**	100 mg	49894
Spiraeoside	5 mg	91802
Steviol	10 mg	19345
Steviolbioside	10 mg	59754
Stevioside*	25 mg	05420590
Stevioside	10 mg	50956
Succinic acid**	100 mg	49893
Swertiamarine	10 mg	90957
Synephrine	50 mg	75256
Syringic acid	100 mg	63627
Syringin (Eleutheroid B)	10 mg	90974
Tangeretin	10 mg	91004
Tanshinone I	10 mg	80714
Tanshinone II A	10 mg	51704
3β-Taraxerol	10 mg	75934
L-(+)-Tartaric acid**	100 mg	41447
Taxifolin*	10 mg	03890585
Taxifolin	25 mg, 100 mg	78666
Tectoridin	50 mg	89948
Tectorigenin	25 mg	67359
Terpinen 4-ol*	50 mg	03900590
Terpinen-4-ol	50 mg	49598
α-Terpinene	100 mg	72777
γ-Terpinene	1 mL, 5 mL	86476
γ-Terpinene*	100 mg	04640590
α-Terpineol*	100 mg	03420590
(+)-α-Terpineol	5 mL	83073
(-)-Δ9-Tetrahydrocannabinol, solution ~1 mg/ mL in ethanol	1 mL	56296
Tetrahydrocurcumin	10 mg	50202
Theaflavin	1 mg	55016
Theaflavin 3,3'-digallate	1 mg	92223
Theaflavin monogallate	1 mg	53963
Theophylline	1g	PHR1023
Thujone Standard Mixture	1 mL, 5 mL	04314
Thymol*	100 mg	00670590
Thymol	500 mg	72477
Tiliroside	10 mg	79257
Tribulosin	10 mg	51675
Trigonelline hydrochloride	100 mg	61407
1,3,6-Tri-O-galloyl-β-D-glucose	10 mg	78864
(S)-ar-Turmerone	10 mg	42258

Description	Package	Cat. No.
Umbelliferone	50 mg	54826
Umckalin	10 mg	50792
Ursolic acid*	10 mg	03240595
Ursolic acid	5 mg, 25 mg	89797
(+)-Valencene	50 mg	06808
Valerenic acid*	10 mg	02010595
Valeriana officinalis extract	150 mg	05105001
Vanillic acid**	50 mg	68654
Vanillic acid 4-β-D-glucoside	5 mg	14515
Vanillin**	50 mg	30304
N-Vanillynonanamide	50 mg, 100 mg	15971
Vasicine	10 mg	92951
Verbascoside*	10 mg	00820580
(1S)-(-)-Verbenone	1 mL, 5 mL	94882
Vescalagin	5 mg	76418
Vicine	10 mg	78260
Vincamine	50 mg	75778
Vitexin*	10 mg	00840595
Vitexin	10 mg	49513
Vitexin 2-O-rhamnoside*	10 mg	00660585
Vitexin 4''-O-glucoside	5 mg	43907
Wedelolactone	10 mg	56639
Withaferin A	10 mg	89910
Withanolide A	10 mg	74776
Withanolide B	10 mg	94284
Withanone	10 mg	90896
Withanoside IV	10 mg	94186
Withanoside V	10 mg	66042
Xanthohumol*	10 mg	01130595
Xanthotoxin	50 mg	56448
Yangonin	5 mg	75575
Zingerone	5 mg	88787

*Primary pharmaceutical reference standard HWI
 **TraceCERT®, certified reference material

Other Reference Materials

Pharmacopeia Compendial Standards

For testing according to pharmacopeia monographs, MilliporeSigma distributes compendial standards from the USP and the European Pharmacopoeia (EP). Find the corresponding product listings at [SigmaAldrich.com/usp](https://www.sigmaaldrich.com/usp) and [SigmaAldrich.com/ep](https://www.sigmaaldrich.com/ep) respectively.

Inorganic Certified Reference Materials (CRMs)

Herbal Medicinal Products should be tested for the presence of potentially harmful inorganics such as Cadmium, Lead or Mercury. Under the *TraceCERT*® brand, we offer a comprehensive range of inorganic CRM solutions, suitable for ICP, AAS and Ion Chromatography. The products are manufactured according to ISO/IEC 17025 and ISO Guide 34 accreditation. An overview and comprehensive information, as well as a brochure download link can be found on [SigmaAldrich.com/inorganiccrm](https://www.sigmaaldrich.com/inorganiccrm).

Pesticides

Especially in plant materials originating from cultivation, traces of pesticides might be present. Our comprehensive PESTANAL® and *TraceCERT*® ranges of pesticide standards and CRMs are ideal for their analysis. A complete list of the more than 1400 products are listed on [SigmaAldrich.com/pesticides](https://www.sigmaaldrich.com/pesticides).

Mycotoxins

Fungal infection of plants can lead to mycotoxin contamination of plant derived products. To ensure the safety of these products, testing for mycotoxins is therefore important. Find a comprehensive product listing, analytical methods guide as well as the mycotoxin standards brochure on [SigmaAldrich.com/mycotoxins](https://www.sigmaaldrich.com/mycotoxins).

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- Economic, convenient and easy to use
- Long shelf life

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